# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

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#### Abstract

This study investigates the scaffolding process and student interaction, from a sociocultural perspective, in a tabletop assisted language learning environment for collaborative reading. The study furthers understanding of features of traditional conceptualizations of scaffolding as a learning construct in the context of technology-mediated social interaction. This scaffolding manifests when learners interact with one another in different user (verbal and non-verbal) modes, and with elements or attributes of tabletop technology during collaborative reading tasks.

Tabletop technology is seen to add an extra dimension to the scaffolding metaphor, and this study is an attempt to explore features of this metaphor and how scaffolding is applied in this new learning platform. To achieve this, a design-based approach as adopted, resulting in a multi-touch tabletop application for digital collaborative strategic reading (DCSR). The DCSR application is designed to lead students through several digital reading stages: previewing, brainstorming, prediction, click and clunk, get the gist, and wrap-up.

DCSR was trialled with four students of English as a second language (ESL) over five instruction sessions. The sessions were video-recorded, and at the end of the five sessions students were interviewed to provide self-reports of their experiences of the learning environment, the nature of assistance they received, and how they viewed their performance in this environment.

Analysis of verbal, non-verbal, and system/technical modes of interaction provided an overview of the learning context for examining scaffolding processes and student interaction. Findings reveal a range of interactions (student–student, student–tabletop, and student–tabletop–student interactions). These were brought together under a taxonomy of functions employed to assist the students' reading comprehension and demonstrate that the tabletop computer can provide scaffolding for reading comprehension via user (verbal and non-verbal) scaffolding strategies and system/technical scaffolding tools.

### Declaration

I declare that this thesis is my own work and that I have correctly acknowledged the works of others. This thesis contains materials which has already appeared in the following paper:

Maslamani, Jaber Ali; Windeatt, Scott; Olivier, Patrick; Heslop, Phil; Kharrufa, Ahmed; Shearer, John; Balaam, Madeline. (2012). Collaborative strategic reading on multi-touch and multi-user digital tabletop displays. In: CALL: Using, Learning, Knowing: EUROCALL Conference, 22-25 August 2012, Gothenburg, Sweden.

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Signature:

## Dedication

To my mother, there are not enough words to describe how important you are to me. Your prayers were the light that led not only my thesis journey but also my whole life.

To the memory of my father who passed away while doing my PhD. Your prayers and wise words were always ringing in my mind and beating in my heart.

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To the joy of my life, my lovely kids: Abdulrahman, Abdulelah, Rayyan, Meral and Eyad.

To my beloved brothers and sisters for their unfailing support and encouragement.

I dedicate this endeavour to you all.

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# Abbreviations

CALL	Computer Assisted Language Learning
CCW	Co-located collaborative writing
CFH	Cognitive flexibility hypertext
CSCL	Computer-supported collaborative learning
CSR	Collaborative strategic reading
DCSR	Digital collaborative strategic reading
ELLs	English language learners
ESL	English as a second language
HCI	Human-computer interaction
IH	Interaction Hypothesis
PC	Pointing and commenting
PnC	Pointing without commenting
P1-P4	Participant 1–Participant 4
R	Reading
S	Speaking
SCT	Sociocultural theory
VIS	Visual Information Store
ZPD	Zone of proximal development

## **Transcription Conventions**

- [ A left square bracket to indicate the point of overlap onset.
- ] A right square bracket indicates the end of overlap
- (0.4) This convention indicates elapsed time within or between utterances in tenths of seconds.
- (.) A dot in parenthesis represents a micro pause in tenths of seconds.
- = Equal signs indicate latching or that there is no gap or break between lines.
- (( )) Double parentheses indicate the transcriber's description.
- $\uparrow \downarrow$  Arrows indicate high or low pitch.
- { } Curly brackets contain the portion of text being read.

Video stills indicate movements of the body (non-verbal conduct). The following video still or snapshot shows an example of hand movements.



### **Contributions Arising from This Thesis**

The following contributions are based wholly or in part on work contained in this thesis:

1. Maslamani, Jaber Ali; Windeatt, Scott; Olivier, Patrick; Heslop, Phil; Kharrufa, Ahmed; Shearer, John; Balaam, Madeline. (2012). Collaborative strategic reading on multi-touch and multi-user digital tabletop displays. In: CALL: Using, Learning, Knowing: EUROCALL Conference, 22-25 August 2012, Gothenburg, Sweden.

2. A Tabletop Computer Application for Reading Comprehension: Digital Collaborative Strategic Reading (DCSR). See Appendix 9

### **Publications During My PhD Study**

Maslamani, J. A. (2013). Potential Integration of a Computer-Mediated Communication Platform into the Saudi EFL Classroom: A Synthetic Review. International Journal of Humanities and Social Sciences, 3(15), 73-78. Available at: http://www.ijhssnet.com/journals/Vol\_3\_No\_15\_August\_2013/9.pdf

Maslamani, J. (2011). The use of silences/pauses in synchronous voice-based computer mediated conversation: a conversation analysis perspective. *Newcastle Working Papers in Linguistics*, 17, 94-102. Available at: http://www.ncl.ac.uk/linguistics/assets/documents/NWPLvol172011CompleteVolume.pdf

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# **CHAPTER 1: INTRODUCTION**

#### **Chapter 1: Introduction**

#### **1.1 Background to the Study**

Second language learners are usually faced with multiple linguistic, social, and cultural challenges as they acquire a target language. Language programmes have considered the use of computers and technology to support second language learners' construction of knowledge, and this has led to an increase in the volume of research on computer assisted language learning (CALL) (Garrett, 2009). The tabletop computer is one of the emerging technology platforms that could have potential for second language learning.

Literature has indicated that the tabletop computer provides a unique combination of face-toface and technology-enhanced communication (Almutairi, 2014; Kharrufa, 2010). Recently research has witnessed an increase in the incorporation of tabletop computers, as an emerging technology, into instruction, in different ways and at different levels (Hornecker et al., 2008; Kharruffa, 2010; Rogers et al., 2008). However, there is a dearth of research exploring how this technology can contribute to English as a second language (ESL) contexts. As a platform that allows users to interact with one another, face-to-face, and at/with the tabletop, much of this research has focused on the potential of the tabletop computer as a tool for facilitating collaborative learning, or "the instructional use of small groups so that students work together to maximize their own and each other's learning" (Johnson and Johnson, 1996, p. 786). Using tabletop computers, small groups of ESL students can carry out a variety of language tasks and communicate with one another or receive assistance from peers in a co-located synchronous computer-based and learner-centred environment.

My idea of conducting tabletop-related research arose out of collaboration between two schools in Newcastle University, the School of Education, Communication and Language Sciences, and the School of Computing Science. A research lab, 'iLab:Learn', was established to facilitate research in Education and Computing Science by combining the expertise of staff and students in pedagogic theory, methods and practice, in web-based technologies, and in pervasive computing and situated interaction. This lab is equipped with emerging technologies including tabletop computers.

With my background in language teaching and my interest in computer-assisted language learning (CALL), I started thinking of ways to introduce this technology into second language

learning, and specifically to collaborative ESL reading. To my knowledge, little, if any, research is currently available on the use of tabletop computers for language learning, and none on reading in particular. Therefore, given that finding ways of helping learners read effectively is a problem I have encountered in my own teaching, an initial decision was made to investigate how the tabletop computer might be utilized to teach reading to English language learners.

In many ESL contexts, and especially English for academic purposes (EAP) contexts, developing effective reading strategies is essential for coping with the amount of reading they are expected to do, mastering reading comprehension is required to deal effectively with large amounts of texts. ESL or second-language (L2) students start by decoding texts (learning to read), then progress to a level where they can benefit from the content of the texts they are reading (reading to learn). ESL tertiary level education is an example of just such a context where students have to be able to read effectively, and ESL students in particular have to learn how to read effectively, in order to benefit from the texts that form a core part of their field of study. The importance of ESL reading instruction for tertiary education has been emphasized by Anderson (1999) and Huckin and Bloch (1993); they and other researchers such as Saville-Troike (1984), Carrell (1989), Hafiz and Tudor (1989) and Fasheh (1995) have argued that "reading is probably the most important skill for L2 students in academic or learning contexts" (Pretorius, 2000, p. 35). The importance of reading for success in language learning is heavily emphasized in the literature (Alderson, 1984; Grabe, 1991; Grabe & Stoller, 2002) and the importance of reading for academic study in English, in particular, is underlined by the fact that students are expected to demonstrate proficiency in this skill in order to gain admission to graduate programmes (Alderson, 1984). However, there is no single reading instruction method which can provide "effective support for comprehension" (Grabe, 2009, p. 218). However, research reviewed in Grabe (2009) strongly supports teaching reading comprehension through the teaching of reading strategies. He suggests introducing effective strategies and having students practise them consistently before, during and after reading activities (Grabe, 2009, p. 218). Block and Pressley (2002, cited in Grabe, 2009, p. 218) emphasise the provision of scaffolding among other strategies such as modelling, guided practice, and independent use of strategies, in strategy instruction.

Wood, Bruner, and Ross (1976) describes scaffolding as a "process that enables a child or novice to solve a problem, carry out a task, or achieve a goal which would be beyond his unassisted efforts" (p. 90). They give as an example of scaffolding the interaction between a

tutor and a child to help the child complete a wooden pyramidal puzzle. Scaffolding is described by Wertsch (1979) as a "dialogically produced interpsychological process through which learners internalize knowledge they co-construct with more capable peers" (cited in Lantolf & Thorne, 2006, p. 282). Scaffolding can involve the use of support devices that do not involve guidance from humans (Salomon et al., 1989). There is also what are called procedural prompts or "procedural facilitation" which act as scaffolding because they guide students to carry out different stages of tasks (Bereiter, 1985; King, 1991; Scardamalia & Bereiter, 1985) as a result of collaborating and working together "to maximize their own and each other's learning" (Johnson & Johnson, 1996, p. 786).

Building on scaffolding as a reading comprehension-strategy instructional tool (Block & Pressley, 2002, cited in Grabe, 2009, p. 218), collaborative strategic reading (CSR) is an instructional approach with the potential to offer an additional perspective to this study, designed to offer instruction in explicit multi-strategies and clearly specified procedures for L1 and L2 reading comprehension (Grabe, 2009). CSR was originally developed to promote language learning in general and to develop reading comprehension in particular. It is adapted from reciprocal teaching (Palincsar & Brown, 1984) which emphasizes features of effective instruction, such as collaborative group work, interactive dialogue, and clearly specified procedures (Kim et al., 2006, p. 236). Such instruction has been empirically demonstrated to enhance reading comprehension and help avoid or overcome text comprehension failure (Bremer et al., 2002; Klingner & Vaughn, 1998, 1999; Klingner et al., 1998; Vaughn & Klingner, 1999; Vaughn et al., 2001). These strategies support collaboration at the before, during and after stages of the reading activity.

The tabletop computer is an example of a tool which has the potential to facilitate such collaboration in the language learning classroom. The main features of the tabletop computer platform are the opportunities they can provide for face-to-face communication and technology-mediated communication, and this could contribute to the creation of enhanced communicative spaces for language learning; however, little research exists to support this claim (see, for instance, Almutairi, 2014; Seedhouse & Almutairi, 2010).

DCSR was then designed and developed to make investigation of such potentials possible. DCSR is an integrated application that combines the strengths of collaboration around a table (where pen-and-paper-based CSR is usually conducted) and those of collaboration around a digital tabletop. A traditional table is a surface learning tool well known for its axiomatic and intuitive support for small group collaboration, and very familiar in educational settings. These features, as well as the rich experience that learners carry as a result of daily contact with tables in classrooms (Kharrufa & Olivier, 2010; Scott et al., 2003), have motivated technologists to introduce interfaces for digital tabletops (Kharrufa & Olivier, 2010) that share features of interaction and communication, with activities conducted around traditional tables.

DCSR builds on conventional CSR and involves a number of stages: in the first stage, students are given a preview of the text. In the second stage, they are encouraged to brainstorm about the subject generally, and predict what the document will contain in the third stage. In the third stage, they identify unknown words within the text, one paragraph at a time. The unknown words are then collaboratively examined by the group (in the case of this thesis, consisting of four students) using various digital strategies such as (1) showing a sentence containing unknown words, (2) showing the sentences before and after that contain unknown words, (3) breaking words down into prefixes, roots, and suffixes (4) breaking words into smaller meaningful parts (derivatives), and (5) obtaining an on-screen dictionary definition. The students then write the gist of the paragraph. Once all the paragraphs are viewed, the final (wrap-up) stage requires students to generate questions to summarize what they have learned.

#### **1.2** Significance of the Study

The current study aims to draw the attention of the CALL research community to an emerging language-learning resource (the tabletop computer) and to the language-learning opportunities offered by such a platform. The study will inform language researchers and teachers about the nature of mediation-oriented talk and behaviour that this platform can facilitate. It also aims to overcome limitations in "understanding how learners use the multi-touch environment" (Higgins et al., 2011, p. 1) such as the tabletop computer which may lead to new trends and forms in language pedagogy, language use, and language discourse. "Rapid evolution of communication technologies has changed language pedagogy and language use, enabling new forms of discourse, new forms of authorship, and new ways to create and participate in communities" (Kern, 2006, p. 183). Investigating different verbal and non-verbal scaffolding behaviours, while reading collaboratively on tabletop computers, may yield information about the nature of scaffolding and how it can facilitate language learning generally and reading comprehension specifically. It can also provide information about those scaffolding strategies and tools that lead to more productive (or less productive) collaboration, and other strategies that may help or hinder communication.

An examination of scaffolding on and from the tabletop computer can contribute to our understanding of the potential benefits of scaffolding collaborative ESL reading. This may help improve the design of collaborative reading applications for tabletop computers as well as contribute to more general understanding of how scaffolding contributes to language development and reading comprehension, thus offering insights into designing software tools that will more effectively lead to positive learning opportunities.

The investigation of user (verbal and non-verbal) scaffolding and system/technical scaffolding as human sociocultural activities, held at and through tabletop technology, can show how such strategies and tools in the environment—including tabletop technology—can mediate learning. The tabletop computer is a type of technology, "just a tool, but, like all tools, it mediates and transforms human activity" (Warschauer, 2005, p. 48). Warschauer (2005) refers to Gregory Bateson's (1972) "thought-provoking" question, 'where does a blind man's sensory mechanism end? Does it stop at the end of his hand, at the end of his walking stick, or somewhere in between?'" (Warschauer, 2005, p. 41). This question makes one think about what strategies and tools can do when humans use them in specific sociocultural circumstances. For researchers, what a blind man can do with a stick is receiving more attention than the blind man and the stick (Warschauer, 2005, p. 41). Therefore, "tangible technologies and shared interfaces [such as tabletops] create new paradigms for mediating collaboration through dynamic, synchronous environments, where action is as important as speech for participating and contributing to the activity" (Falcão & Price, 2011, p. 539).

Tabletop computers add an extra dimension to such ESL interaction, but a detailed analysis of scaffolded interaction at the tabletop computer is currently lacking, and this study provides such an analysis in the context of a collaborative reading activity. The study bridges a real research gap relating to this type of interaction at the tabletop computer.

This work serves to understand detailed multi-user, multi-touch, and digital tabletop interaction (Tse et al., 2007) and adds to the growing literature about CALL, technology-enhanced interaction, and reading. According to Stockwell (2012), "by analyzing what students do as they use CALL software ... we can begin to understand the kinds of strategies students use (or lack thereof) as they work their way through CALL programmes" (p. 14).

The Digital Collaborative Strategic Reading (DCSR), as a product of this thesis, is designed as a language learning platform where ESL students use for reading comprehension.

The lack of suitable collaborative reading applications, which can run on the tabletop computers, and my aim to investigate the potential benefits of the tabletop computer for English language learners', were the main motives for the creation of an appropriate reading application, Digital Collaborative Strategic Reading (DCSR). It was designed and developed specifically to provide a tool to investigate scaffolded reading instruction and acquisition on the tabletop computer. The DCSR allows users to read collaboratively on multi-touch and multi-user digital tabletop computers that support both face-to-face and computer-based interaction. It is a computer programme, designed to provide systematic instruction on tabletop computers using four main comprehension strategies, which together form the CSR instructional approach.

Importance and originality of the application (DCSR) lie in the design of embedded tools that forms the structure of the collaborative reading activity and allows simultaneous face-to-face and technology-mediated communication. The application provides opportunities for collaboration around the tabletop computer due to its systematic instruction which take students through stages of reading without the constant presence of the teacher.

The application considered three main points of strength: the nature of tables which allows students to sit around and face one another, the multi-touch capability of the tabletop computer which allows manipulating various artefacts on the surface of tabletop computer while being able to type using tangible keyboards, and the effective reading instruction of the CSR Approach, which have been empirically tested and had positive results with regard to the support of students' reading comprehension.

Although the CSR principles were retained in the design of DCSR, in order to keep smooth flow of students' interaction, managerial tools and material tools were introduced and embedded in the design. Such tools introduced comprehension strategies explicitly for students and enforced strategic learning behaviour, gave them opportunities to practice different reading strategies and write summaries about main ideas, helped them identify difficult words when reading the text and verbalize or externalize their thoughts and problems they face while reading.

Future research can be facilitated in several ways using the DCSR application. Further research could be done to investigate the use of system tools in peer feedback, the effect of vocabulary learning tools on students' reading comprehension, and collaborative writing strategies and how it can impact reading comprehension. This application can also draw researchers' attention to

ESL speaking skills and how the tabletop computer could enhance them. Various related issues in this regard could be investigated as well.

#### **1.3 Research Aims and Questions**

The significance of the study and the role of tabletop technology in language learning were outlined in the previous section. It is argued that a newly emerging technology, the tabletop computer, may scaffold English language students' reading comprehension development. This section presents the purpose of this study and the research questions as they define the scope of the study. This research aims to contribute to the body of research into English reading development by examining and investigating how the affordances of the tabletop computer environment might help in scaffolding learners' reading comprehension.

The purpose of the study is to explore the potential of the tabletop computers to support language learning in general and reading comprehension in particular. A primary research goal is to further our understanding of how ELLs deploy the resources available in the tabletop-assisted language learning environment to construct meaning from a text and to overcome comprehension breakdowns. According to van Lier (2000), "the environment provides a 'semiotic budget' ... within which the active learner engages in meaning-making activities together with others who may be more, equally, or less competent in linguistic terms" (p. 252). Not only technology itself but also "particular uses of technology" can have effects on learning of language and culture (Kern, 2006, p. 200). Therefore, the aims of this research are as follows:

- 1. To explore the practicalities of designing an application which can run on the tabletop computer and scaffold students' reading comprehension development.
- 2. To understand how such an application can scaffold students' reading comprehension on the tabletop computer.

This study revolves around the following research argument:

This thesis argues that the tabletop assisted language learning environment, as a whole learning environment, can offer scaffolding for students' reading comprehension.

#### **Thesis Question:**

How can tabletop computers scaffold ESL reading comprehension? Based on this question, the following research questions are formulated:

#### **Research Questions:**

- 1. How can a computer application be designed to scaffold students' reading comprehension on the tabletop computer? (addressed in Chapter 4)
- 2. What are the user strategies and the system tools that could scaffold students' reading comprehension on the tabletop computer, and what are the functions of these strategies and tools? (addressed in Chapter 5)
- 3. What are the students' experiences when reading on the tabletop computer? (addressed in Chapter 5)

No suitable computer applications currently exist which focus on scaffolded reading comprehension development. In fact, it was not possible to carry out this research or to fulfil its aims without designing an application which was compatible with the tabletop computer. A cross-disciplinary collaboration was necessary in order to develop a suitable computer programme that would adequately achieve the goals outlined in these research questions. To that end, a computer application designer with similar research interests was brought into the project to collaborate in creating the software<sup>1</sup>, and through an iterative process of designing and amending paper versions, and then digital copies, a version of the application was produced for use in this study.

#### **1.4** Organization of the thesis

Following this introductory chapter, which offers the background to this study, its significance, and the research aims and questions controlling it, an overview of the organization of the thesis is given. The study has six chapters: Chapter Two set the scene for the research topic reviewing the literature related to aspects of scaffolding. It consists of three main sections; the first one focuses on the concept of scaffolding with regard to its definitions, how the concept has changed over time, the main types of scaffolding, and the place of scaffolding within the sociocultural theory. The second briefly reviews reading comprehension models (bottom-up, top-down, and interactive models) including the CSR approach due to its role in the design of the DCSR. The

<sup>&</sup>lt;sup>1</sup> Philip Heslop, a senior computing officer in the School of Computing Science, Newcastle University. Philip is involved in doing research on digital tabletops, user interaction, computer games, educational technology, and computer graphics. Working closely together, I designed and he developed a computer application that would directly meet the needs of this research.

third section briefly describes CALL and its relationship with Vygotskian concepts, and discusses the potential of the tabletop computer as a CALL technology.

Chapter Three begins with an overview of the methodology and continues with a description of the research design, participants, data collection instruments, the reading application design and the research location, followed by a discussion of data analysis procedures and explanations of issues of validity, reliability, and ethical considerations.

Chapter Four explains in detail the affordances of the tabletop computer that could scaffold reading comprehension. It attempts to answer the first research question (*How can an application be designed to scaffold students' reading comprehension on the tabletop computer*?). In other words, it investigates what the tabletop computer can offer English language learners with regard to supporting collaborative reading comprehension, or what tools can be embedded into a DCSR system in order to support reading comprehension on the tabletop computer.

In Chapter Five two types of analysis are presented: an analysis of students' collaborative reading interaction on the tabletop computer, and an analysis of students' interviews. Analysis of a video recording of students' face-to-face collaboration and of the activities on the tabletop computer surface document how students practise scaffolding one another while collaborating face-to-face or via the tabletop computer. Analysis reveals several types of scaffolding strategies and tools: user strategies (*verbal* strategies, *non-verbal* strategies, joint *verbal and non-verbal* strategies), and *system/technical* tools.

Chapter Six provides an overview of the study and a discussion of the main concepts and findings. Chapter Seven presents a discussion of what the study contributes to knowledge, limitations of the study, implications of the study, and recommendations for future research.

#### **1.5** Chapter summary

This chapter is an introduction to the current study. It presents a background to the study, the significance of the study, and research aims and questions. An overview of the organization of the thesis concludes the chapter. The next chapter reviews the literature related to the topic of the research study.

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# CHAPTER 2: REVIEW OF RELEVANT LITERATURE

#### **Chapter 2: Review of Relevant Literature**

#### 2.1 Introduction

The previous chapter set the scene for the research topic by placing it into its context. This chapter aims to provide a review of the literature related to aspects of scaffolding reading comprehension on the tabletop computer. The chapter consists of three main sections. The first focuses on the concept of scaffolding with regard to its definitions, how the concept has changed over time, the main types of scaffolding, and the place of scaffolding within sociocultural theory. The second section briefly reviews reading comprehension models; the CSR reading approach is given focus because of its importance to the design of the DCSR. The third section commences with a brief description of CALL and its relationship with the Vygotskian concepts. This section concludes with potentials of the tabletop computer, as a CALL technology.

#### 2.2 Scaffolding

#### 2.2.1 Defining the concept of scaffolding

According to Clark and Graves (2004, p. 571) and Thomson (2009), Wood, Bruner, and Ross (1976) were the first to use the term *scaffolding* as a metaphor in its Vygotskian sense. However, according to Anderson et al. (1977), scaffolding had already been introduced in the work of Ausubel (1963, 1968) within the notion of "ideational scaffolding": "Ausubel (1963, 1968) proposed that a reader's abstract cognitive structures provide the 'ideational scaffolding' for the detailed information contained in text" (Anderson et al., 1977, p. 2). Cook (2008) summarized scaffolding in the following manner:

For some, anything the learner consults or uses constitutes scaffolding, such as the use of grammar books or dictionaries; virtually anything that happens in the classroom, then, can count as scaffolding, say the traditional teaching style ... known as IRF ... or any kind of correction by the teacher. Others [consider] scaffolding [as] social mediation involving two people, and is performed by a person who is an expert. Some have extended scaffolding to include help from people at the same level as the student ... In teaching terms, this includes everything from teacher-directed learning to carrying out tasks in pairs and groups. (p. 229)

Although the idea of scaffolding can be traced to 1963, almost any work on scaffolding refers back to Wood et al. (1976) (Renshaw, 2013); this is due to the latter's thorough investigation

and detailed discussion of scaffolding. Wood et al.'s research was conducted to investigate how unassisted children could perform a block construction task, and how they would interact with the tutor to receive assistance in order to complete a task that they would not have been able to complete without the tutor's help. They explained these processes using the idea of scaffolding.

Wood et al. (1976) defined scaffolding as a "process that enables a child or novice to solve a problem, carry out a task, or achieve a goal which would be beyond his unassisted efforts" (p. 90). Students are assisted to achieve beyond their current capabilities by tutors, teachers or peers, which leads to their cognitive development (Aljaafreh & Lantolf, 1994; Lantolf & Thorne, 2006) and co-construction of meaning according to the sociocultural view of learning (Vygotsky, 1978). Wood et al. (1976) described scaffolding as consisting of two main essential elements: controlling task elements, which are beyond the learner's capabilities, and permitting the learner to concentrate only on elements within their abilities, thus leading to successful completion of the task and the development of task competence. Features of such assistance during child–tutor interaction (tutoring) were termed by Wood et al. (1976) as scaffolding functions. Other features of scaffolding were included in Lidz's (1991) twelve component behaviours of adult mediating instruction. Scaffolding is also described by Wertsch (1979, cited in Lantolf and Thorne, 2006, p. 282) as a process through which learners internalize knowledge they have already co-constructed with other more knowledgeable peers.

There are certain key elements considered critical to the success of scaffolding (Puntambekar & Hübscher, 2005). The first is *intersubjectivity*, or shared understanding of the goal of the task, where both the more knowledgeable and the less knowledgeable share understanding of the goal of the task and what it is supposed to achieve. The second element is the *ongoing diagnosis* of the learners' level of understanding to tailor the amount of support they need from more capable adults or peers. The third element is *fading* the support given to the learner. What happens during fading is a transfer of the responsibility for controlling the task from the more capable adult or peer to the (less capable) learner.

#### 2.2.2 Extending the concept of scaffolding

Since 1976 the scaffolding concept has been extended from its original meaning of assistance from a single expert like a parent (Wood et al., 1976) or teacher, to include more than one, such as peers (Donato, 1994; Fernández et al., 2001). For a task goal to be accomplished, the expert provides assistance in six different forms: recruitment, reduction in degrees of freedom,

direction maintenance, marking critical features, frustration control, and demonstration (Wood et al., 1976, p. 98) (see Appendix 4 for explanation of these terms).

The concept of scaffolding has been extended from one-to-one tutoring to include selfscaffolding or metacognitive scaffolding (Holton & Clarke, 2006), collaborative learning (Rojas-Drummond & Mercer, 2003) and computer-assisted collaborative language learning (Beatty, 2003). According to Beatty,

Collaboration is among the most useful ways in which learners acquire language at the computer. When two or more learners sit at a computer and discuss process and content in the target language, they often engage in scaffolded learning, helping each other improve their language. (p. 99)

Another form of scaffolding is the work on reciprocal teaching by Brown and Palincsar (1985), who stated that "reciprocal teaching is a form of expert scaffolding" (p. 13). Another study by Palincsar and Brown (1984) was based on expert scaffolding. Both studies focused on fostering small-group students' reading comprehension by infusing four comprehension strategies: summarizing, questioning, clarifying and predicting. Reciprocal teaching, is an instructional method in which the teacher and students create a dialogue about a part of the reading text which the students are jointly trying to understand. During this dialogue, the content of the test is summarised, questions about the gist are asked, and any misunderstandings are clarified (Brown and Palincsar, 1985).

The scaffolding frameworks of Wood et al. (1976) and Lidz (1991) were adopted in several studies (De Guerrrero & Villamil, 2000; Donato, 1994, 2000; Ohta, 1995) to analyse learner-learner interaction. According to Donato (1994), student of equal status can provide assistance to their peers just like that in adult–child tutoring. A similar study by Donato (1994) observed French students' mutual scaffolding and how they interacted and supported their peers. He used microgenetic analysis to analyse the observation data in order to explore how students provide mutual assistance. He also adopted Wood et al.'s (1976) framework for analysing "features of scaffolding" during students' peer interaction. Donato's findings confirmed that peer scaffolding occurs among French students performing language tasks. He also found that more capable learners are a source of assistance to their less capable peers during peer interaction.

Pea (2004) featured the above dimensions (computer-assisted collaborative learning, reciprocal teaching, peer scaffolding) as social dimensions of the concept of scaffolding. Pea believed that

social interactive responses are contingent on and tailored to the learner's needs in the scaffolding process. The other dimension Pea observed was a technological dimension, which involved designed artefacts as tools to mediate the process of learning through adopting the notion of scaffolding. Designers of technological tools such as Bell and Davis (2000), Toth et al. (2002), and Jackson et al. (1994) argued that such tools have the capability to help learners overcome difficult tasks by providing a supportive structure. Other studies, for instance those of Quintana et al. (2002) and Sherin et al. (2004), confirmed that the scaffolding metaphor has been clearly extended to include technology. A study by Soloway et al. (1994) introduced a learner-centred scaffolding design to fit learners' needs. A similar study built scaffolding, with guidance and support provided by the system" (Jackson et al., 1998, p. 187). Soloway et al. (1994) argued that building scaffolding into software offers learners individualized support no matter what skills or learning styles they have, or what backgrounds they come from.

There have been some studies on tabletop computers, and on building scaffolding into software designed as a tabletop interface by infusing scaffolding into the design of the software. The work of Heslop et al. (2015) is one such example, which allowed the CCW (co-located collaborative writing) application to provide scaffolding for students via what they called "proposals" or decision points. These elements were designed to elicit collaborative behaviour and, in particular, decision-making; however, these scaffolding elements were not based on any well-known framework for scaffolding functions or features found in the literature in scaffolding, such as Wood et al.'s (1976) "scaffolding functions" or Lidz's (1991) twelve components of adult mediating instruction. Neither was designing scaffolding tools for language learning a focus of Heslop et al.'s (2015) study, other than being an evaluation of CCW from a HCI (Human Computer Interaction) perspective. One general aim of their study and of a number of other studies (Falcão & Price, 2011; Higgins, et al. 2011; Kharrufa, 2010; Mercier, 2014; Mercier & Higgins, 2013, 2014; Mercier et al., 2015) was to investigate the role of the tabletop computer in education. One of the principal goals of designing the "digital mysteries" application, for example, is to "provide more integrated scaffolding for low achieving groups" (Kharrufa, 2010, p. 124). However, the scaffolding processes have not been investigated from a linguistic point of view or with regard to scaffolding strategies or tools and functions. Although digital mysteries consist mainly of reading texts, these texts form scrambled narrative threads which need to be organised by students in order to solve the mysteries; neither the texts themselves nor the problem-solving activity can be considered

equivalent to kind of texts and reading activities which are typical of language courses such as, for example, those which prepare students for IELTS and TOEFL tests. In other words, these reading texts were not meant to be used for practising or enhancing reading comprehension.

Research on tabletop computers has not investigated scaffolding of second language learning or, more specifically, the development of particular linguistic features or skills such as reading comprehension. In addition, no study has yet involved the use of microgenesis, a "Vygotskian methodological construct" (Gutiérrez, 2008, p. 120), as a tool for investigating and observing instances of language learning on the tabletop computer as they occur in "short periods of time" (Gutiérrez 2008, p. 120). The feature which makes this methodological tool particularly appropriate for analysing language learning social episodes is the sociocultural approach it is drawn from. This is why Donato (1994) used microgenetic analysis both to investigate how learners assisted each other and to understand their interlanguage development using the scaffolding framework of Wood et al. (1976).

#### 2.2.3 Embedded/static scaffolding vs. contingent/dynamic scaffolding

Since the term "scaffolding" was initially introduced by Wood et al. (1976) in its widespread and more cited meaning of adult–child tutoring, "scaffolding has been broadened to include a multitude of different tools and resources that can be used by students to assist them with instructional activities" (Brush & Saye, 2002, p. 2). These different tools, or scaffolds may be used by learners to support their learning and developing understanding through the use of technology. Greenfield (1984, cited in Holton & Thomas, 2006, p. 79), for example, identified five characteristics of the scaffold as used in building construction: (1) a support, (2) a tool, (3) allows for accomplishing the task, (4) extends the range of worker, and (5) aids the worker if needed. These different tools, or scaffolds may be used by learners to support their learning and developing understanding through the use of technology and the design of scaffolding tools to support learning has been explored by a number of researchers (Kharrufa, 2010; Kolodner et al., 2003; Reiser et al., 2001; Stahl, 2006) who consider the provision of scaffolding a key feature of computer support.

Brush and Saye (2002) differentiated between two levels of scaffolding with respect to source: hard scaffolds are any scaffolding tool planned in advance and integrated into the design of the task (Brush & Saye, 2002), while soft or contingent scaffolds are strategies that are adaptable during students' interactions with the teacher or peers. According to Jackson et al. (1998),

Building scaffolding into software offers the opportunity to provide for diversity through individualized support that accommodates learners of different skills, backgrounds, and learning styles, and to support growth by making more powerful functionality available as the learner develops expertise. (p. 187)

Jackson et al. (1998) noted the strong potential of providing technological scaffolding due to the powerful functionality of technology. An example of building scaffolding into software is the tabletop computer's potential to provide scaffolding via integration of tools (Kharrufa, 2010; Piper & Hollan, 2009). Kharrufa (2010) added that the tabletop computer has the potential for "coaching", a term which means scaffolding and fading. Integrating scaffolding and fading into the design of applications for the tabletop computer is believed to reduce the level of scaffolding teachers need to provide during a task, giving them more time to facilitate the flow of the task by checking more students as needed.

Despite the potential benefits of embedding scaffolding, Puntambekar and Hubscher (2005) criticized the static nature of these tools, arguing that they cannot provide adequate scaffolding because they are not adaptable to students' skills and knowledge. However, several other studies found static or embedded scaffolding useful in teaching and learning (Hicks & Doolittle, 2008; Laura et al., 2012). Petsangsri (2002), for instance, conducted a comparison between two groups of students with regard to their learning outcomes in two environments (cognitive flexibility hypertext (CFH) with and without embedded scaffolding) in order to investigate the effect of embedded scaffolding on CFH. She concluded that despite insignificant differences between the groups in achievement scores and amount of time spent using the software, "embedded scaffolding may help students to improve their learning in the CFH program to some extent" (p. 4) because significant differences were found among participants from different schools. Likewise, Zangori et al. (2015) investigated the effects of scaffolds embedded in a curricular modelling task on students' formulation of explanations (p. 957). Their quantitative analysis showed less positive results for the same group.

Another type of scaffolding is contingent scaffolding, which is used to denote scaffolding tailored to fit students' needs. Studies such as those of Wood and Middleton (1975) and Wood et al., (1978), which were carried out during the same time period as Wood et al. (1976), focused on contingency and investigated how tutors adjust the assistance offered to learners according to how successful they are in achieving task goals. The more successfully they appear to be proceeding towards a goal the less help they are offered.

#### 2.2.4 Scaffolding within the sociocultural theory of Learning

This study draws on the sociocultural theory of learning in order to investigate the nature of scaffolding on the tabletop computer and to explore how it is employed by learners during collaborative reading using this technology. This section introduces the main sociocultural concepts of mediation and the Zone of Proximal Development (ZPD), which underpin the study. The sociocultural approach allows for "the coherent integration of affective, cognitive, and interactionist perspectives" (Levy & Stocwell, 2011, p. 110). Vygotsky (1978) believed that "learning resulted from social interaction rather than through isolated individual effort, and that engagement with others was a critical factor in the process" (cited in Levy & Stockwell, 2006, p. 116).

Figure 2.1 below illustrates key concepts in the study: sociocultural theory (SCT), scaffolding, ZPD and learners' interaction with peers and technology. The role of interaction has also been emphasized by the SCT, which is rooted in Lev Vygotsky's work (Cook, 2008). The SCT places special emphasis on the role of social and cultural contexts and environments (Poehner, 2008) and on interaction with other language users, who help the learners use language in a way they would not be able to without assistance (Heins et al., 2007). The aim is to achieve Vygotsky's goal "in the sense that what one can do in cooperation with others today one can do alone tomorrow" (cited in Lantolf, 2005, p. 336). Lightbown and Spada (1999) pointed out that, according to SCT, "learners advance to higher levels of linguistic knowledge when they collaborate and interact with speakers of the second language who are more knowledgeable than they are" (p. 44). Norris and Ortega (2003) argued that language learning, as well as any other kind of learning, should involve social interaction rather than individual action. For these reasons, peer-to-peer interaction is an important aspect of the individual learning process.



Figure 2.1. Theoretical framework

The difference between what learners can do alone and what they may perform with mediation is termed the zone of proximal development (ZPD) (Poehner, 2008). Vygotsky (1978) defined this as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). However, as Stone (1998) pointed out, the 1976 conceptualization of scaffolding, and the theoretical notion of the ZPD had not been linked at that time: this was proposed a few years later (Bruner, 1985; Cazden, 1979) when the concept of scaffolding was interpreted as the support and mediation which learners experience within the ZPD in the performance of a new task.

The concept of scaffolding and the Zone of Proximal development (ZPD) has received much attention from sociocultural theory. The concept of ZPD is used to understand the process of language development through students' interactions with the teacher or during collaboration with peers while the level of scaffolding provided is linked to the students' ability (Clark & Graves, 2004) as "varying levels of support are possible, and the more complex a task is, the more support students will need to accomplish it" (pp. 571–572).

In a somehow similar way to sociocultural theory with regard to mediation, other researchers have claimed that interaction with others leads to the successful acquisition of L2. The early
version of Long's (1983, cited in Ellis, 2000, p. 199) Interaction Hypothesis (IH) claimed that acquisition is facilitated by the negotiation of meaning that occurs during communication breakdown; such negotiation provides opportunity for comprehensible input. The "negotiation of meaning" has been defined by Pica (1994) as the "modification and restructuring of interaction that occurs when learners and interlocutors anticipate, perceive, or experience difficulties in message comprehensibility" (p. 494). Krashen's 1985 input hypothesis argues that learners, during interaction, make progress as they comprehend input that is slightly beyond their current stage of linguistic competence (Heins et al., 2007). In the later form of IH, as described by Ellis (2000), the feedback that the learner receives during interpersonal interaction with others contributes to L2 acquisition because interaction "connects input [and] internal learner capacities" (Long, 1996, pp. 451-452).

An important element for acquisition is the negotiation of meaning involved in conversational interaction. According to Cook (2008, p. 225), in order to make interaction useful, communication breakdowns, while working collaboratively, should be resolved continuously. This can be achieved through "repetitions, confirmations, reformulations, comprehension checks, clarification requests, etc." (Long, 1996, p. 418). Lightbown and Spada (1999) argued that "when learners are given the opportunity to engage in meaningful activities they are compelled to 'negotiate for meaning,' that is, to express and clarify their intentions, thoughts, opinions, etc., in a way which permits them to arrive at a mutual understanding. This is especially true when the learners are working together to accomplish a particular goal" (p. 122).

## 2.2.5 Reading model 1: bottom-up, top-down, and interactive models

There are three main reading comprehension models in the literature of reading: bottom-up, the top-down, and interactive. These models mainly explain the interaction between the reader and the text, and contribute to our understanding of how a reading context informs the reading process.

In bottom-up models, learners decode meaning from the text (Grabe, 2009) by recognising grapheme–phoneme (letter–sound level) correspondence, lexical (word level) and syntactic (sentence level) structures in an automatic and rapid (unconscious) way. LaBerge and Samuels (1974) stressed the importance of the unconscious, automatic, rapid recognition of words. Grabe and Stroller (2002) described the reading process as a pattern of creating "piece-by-piece mental translation of the information in the text" (p. 32). Decoding meaning from the reading

text starts with recognition of the correspondence between graphemes and their sound symbols, then gradually moves up to word level, then sentence level. As background topical knowledge is not considered while constructing meaning from the text, this description raises a question: is reading comprehension process that simple? Grabe (2009) and Samuels and Kamil (1988) criticized the bottom-up model for not considering reader's background knowledge. Grabe (2009) went so far as to describe it as an extreme and inaccurate view of reading.

Top-down models of reading focus on prediction in text comprehension and on highlighting the reader's background knowledge of the topic (Grabe, 2009). These models postulate that readers construct meaning from the text by activating their previous knowledge, so that they predict what the topic will be about and look for clues in the text to confirm or reject their predictions (Alderson, 2000; Grabe, 2009; Grabe & Stroller, 2002). However, L2 students with limited background knowledge of a topic may find it difficult to make predictions (Samuels & Kamil, 1988). If their linguistic or cultural knowledge is limited as well, their performance will be poorer than that of L1 students (Grabe, 1988).

Interactive models are considered hybrids of the bottom-up and top-down models. An interactive reading model proposed by Rumelhart (1977) (Figure 2.2) emphasizes the application of "bottom-up" (lower-level) and "top-down" (higher level) reading processes simultaneously in order to interactively construct meaning via different linguistic sources, such as letter–sound level, word level, and sentence level while bringing into play world knowledge (background information) about the topic (Bernhardt, 1991; Grabe, 1991, 2009; Grabe & Stoller, 2002). Unlike the bottom-up model, the interactive model considers the reading process as parallel rather than serial (Rumelhart, 1977).



Figure 2.2 Rumelhart's interactive model of reading Source: Samuels and Kamil, 1984, p. 211

According to Rumelhart's model, the syntactic, semantic, orthographic, lexical, and feature extraction inputs work simultaneously as sources of information for readers:

These knowledge sources are providing input simultaneously and a mechanism must be provided which can accept these sources of information, hold the information, and redirect the information as needed. (Samuels & Kamil, 1984, p. 211)

The Visual Information Store (VIS) is where the graphemic information enters. Relevant information is then extracted and filtered from the graphemic input into the pattern synthesizer where information from multiple resources is processed to provide the most probable interpretation for the text.

Stanovich (1980) introduced his interactive-compensatory model of reading with the assumption that "a deficit in any particular process will result in a greater reliance on other knowledge sources, regardless of [students'] level in the processing hierarchy" (p. 32). For example, if a reader has difficulty when encountering a new word (low-level processing), background knowledge (higher-level processing) can compensate for this difficulty and enable the text to be understood.

#### 2.2.6 Reading model 2: CSR approach

Collaborative strategic reading is a multi-component model for reading comprehension instruction (Boardman et al., 2010) which draws on both reciprocal teaching and cooperative learning (Grabe, 2009, p. 233). It is "an instructional approach for English language learners" (Klingner & Vaughn 2000, p. 70) that supports language acquisition and collaborative reading among peers or small groups. It was developed by Janette K. Klingner and Sharon Vaughn (1996, 1998, cited in Bremer et al., 2002). Vaughn et al. (2001) stated that CSR was designed to address three educational issues:

(a) meeting the learning needs of an increasingly diverse student population, particularly English-language learners and students with learning disabilities; (b) providing an instructional practice that enhances comprehension of text and skills to learn from text; and (c) providing procedures that facilitate peer-mediated instruction. (p. 67)

CSR is based on reciprocal teaching (RT), designed by Palincsar and Brown (1984) for students who have basic decoding skills but find difficulty in constructing meaning from a text. Students

are required to collaboratively employ the following strategies: predicting, summarizing, clarifying, and generating questions. CSR is based on the sociocultural theory that emphasizes the role of social context in the enhancement of students' reading comprehension. Through social interaction, learners develop their ability to comprehend text by employing several reading approaches which involve cognitive strategies. In regard to the notion of "mediation" (Vygotsky) and its impact on CSR, learners receive assistance from each other, from the teacher, and from tools related to the context to help them construct meaning form the text. The notion of self-regulated learning is fundamental to this strategy as students in CSR are trained to take actions and decisions independently and confidently (Klingner et al., 1998). Students in CSR are taught and trained to develop their strategic reading abilities.

CSR has four reading comprehension strategies, "with specific procedures for how to apply them independently" (Vaughn et al., 2001, p. 67), which students learn to use and apply before, during, and after reading. These strategies are (a) preview (before reading), (b) click and clunk (during reading), (c) get the gist (during reading), and (d) wrap-up (after reading) (see Figure 2.3 below). Through discussion with peers, learners practise these four research-based strategies collaboratively to construct meaning from the text (Palincsar & Brown, 1984; Pressley et al., 1995, cited in Klingner & Vaughn, 1998).

**Preview** is a pre-reading strategy that allows learners to have a quick look at title, headings, subheadings, keywords, and underlined, italicized or bolded words as well graphics or charts. The purpose of this strategy is to activate learners' background knowledge and help them predict what they will learn from the reading passage. Therefore, the preview has two strategies: (a) brainstorming and (b) prediction about the topic. Brainstorming elicits learners' prior knowledge about the topic and prediction encourages their motivation (Vaughn et al., 2001).

During reading, there are two CSR strategies: **click and clunk** and **get the gist**. Click and clunk is a self-monitoring strategy. Learners click when they identify words, phrases, or concepts they already know. When they encounter words, phrases, or concepts they do not know or understand, they clunk and record their clunks (Boardman et al., 2010). They stop after every paragraph or two to use possible fix-up strategies to figure out their clunks and to write the main idea (the gist) of what they have just been reading (Boardman et al., 2010; Bremer et al., 2002; Vaughn et al., 2001).

During the **wrap-up** stage, the after-reading strategy, learners ask and answer questions about the most important information they have gone through while reading. Then they review and summarize in writing the most important ideas they found in the passage which contributes to the improvement of their knowledge, understanding and interpretation (Boardman et al., 2010; Klingner & Vaughn, 1999). Figure 2.3 shows the plan for CSR which summarizes strategies that learners employ before reading, while reading, and after reading (Boardman et al., 2010, p. 208).



Figure 2.3 Plan for collaborative strategic reading (CSR) Source: Boardman et al., 2010, p.208

#### **CSR** learning log

Throughout the reading process, learners are directed by their teachers to record their brainstorms and predictions for before-reading strategies, clunks (including their definitions or answers) and gist for during-reading strategies, plus questions, answers, and main ideas in the passage for wrap-up strategies. Figure 2.4 illustrates a CSR learning log, which learners use to keep a record of their strategies (Boardman et al., 2010, p. 210).

CSR Learning Log				
Name:Date:				
Topic:				
BEFORE READING: Preview				
Brainstorm : Connections to prior knowledge				
Predict : What I might learn about the topic				
DURING READING: Section 1				
Clunks:	Fiz	c-up	Stra	tegies
=	1	2	3	4
=	1	2	3	4
==	1	2	3	4
Gist:				
DURING READING: Section 2				
Clunks:	Fix	-up :	Strat	egies
=	1	2	3	4
	1	2	3	4
	1	2	3	4
Gist:				
DURING READING: Section 3				
Clunks:	Fiz	c-up	Stra	tegies
==	1	2	3	4
=	1	2	3	4
	1	2	3	4
Gist:				
AFTER READING: Wrap-Up				
Questions: Write Questions and Answers				
Review : Write one or two of the most important ideas in this passage.				
Be prepared to justify your ideas.				

Figure 2.4. Sample of a paper CSR learning log form

Source: Boardman et al., 2010, p.210

#### **Expert roles**

Collaborative work is crucial to the success of CSR strategies, and learners are assigned different and rotating roles by the teacher before they engage in the learning group work. Different researchers identify different types and numbers of role in the CSR strategy process. Klingner and Vaughn (1999) have listed five roles: leader, clunk expert, gist expert, announcer, and encourager. The leader keeps peers on task by indicating what they should read next and what strategies they apply. The clunk expert reminds students of steps they need to take whenever they have any clunks in order to know the meaning of a new word or concept. The gist expert helps the group and takes part in the discussion to decide on the main ideas and avoid unnecessary details, and to write down and document the best gist in the learning logs. The announcer reminds students to read or share their ideas with the others. The encourager

encourages all students to participate and collaborate with one another and evaluates the cooperative work. Bremer et al. (2002) and Vaughn and Klingner (1999) listed only four roles: leader, clunk expert, gist expert, and announcer. Boardman et al. (2010) listed six: leader, clunk expert, gist expert, question expert, timekeeper, and encourager. The question expert guides students throughout the application of the wrap-up strategy to generate questions and draw together the most important points or ideas from the reading passage. The time-keeper informs students of how much time they have for each section or strategy. However, the most essential expert roles are the first four listed by Boardman et al. (2010): leader, clunk expert, gist expert and question expert. The announcer, time-keeper, and encourager can be compressed into one job description, if necessary; thus, CSR may five or even seven expert roles, but the first four are considered by Boardman et al. (2010) as essential. They were used when designing the cue cards for the expert roles (See Figure. 2.5).

#### **Cue Cards**

Cue cards work as reminders for students, guiding them through all strategies and stages of CSR with hints about what students should do next (Boardman et al., 2010; Bremer et al., 2002, Vaughn & Klingner, 1999).

Leader	Clunk Expert	Gist Expert
BEFORE READING	DURING READING	DURING READING
Preview		
<ul> <li>We know that today's topic is</li> <li>Let's brainstorm. In your learning logs, write everything you already know about the topic.</li> <li>Who would like to share their ideas?</li> <li>Look at the title, pictures, and headings.</li> <li>Now let's predict. In your learning logs, write what you think you will learn about.</li> <li>Who would like to share their heat their heat there?</li> </ul>	<ul> <li>What is your clunk?</li> <li>Does anyone know the meaning of the clunk?</li> <li>If YES: <ul> <li>Please explain the clunk.</li> <li>Does everyone understand now?</li> </ul> </li> <li>If NO: <ul> <li>Reread the sentence without the word. Think about what would make sense.</li> </ul> </li> <li>Reread the sentence with the clunk and the sentences before or after the clunk looking for the sentence or after the sentence or after the sentence sentence or after the sentence sentenc</li></ul>	<ul> <li>Everyone think of a gist and write it in your learning log.</li> <li>Name the most important who or what in this section. Then write the most important information about the who or what. Your gist is 10 words or less.</li> <li>Who would like to share their gist?</li> </ul>
DUDINC DEADINC	<ol> <li>Look for a prefix suffix or</li> </ol>	Question Export
Poad	root in the word	DUPINC PEADINC
<ul> <li>Read</li> <li>Who would like to read the next section?</li> <li>Click and Clunk</li> <li>Write your clunks in your learning log.</li> <li>Clunk expert, please help us out.</li> <li>Get the Gist</li> <li>It's time to get the gist. Gist expert, help us out.</li> <li>[Repeat steps for each section]</li> <li>AFTER READING</li> <li>Wrap-Up</li> <li>It's time to review. Write down one or two of the most important ideas from the passage.</li> <li>Let's share our most important ideas.</li> </ul>	root m the word. 4. Break the word apart and look for smaller words you know.	<ul> <li>DURING READING</li> <li>Wrap-Up</li> <li>Now let's think of some questions to check whether we understood what we read. Write your questions and answers in your learning logs.</li> <li>Who would like to share his or her best question?</li> <li>Who would like to answer that question?</li> <li>Where did you find the information to answer that question?</li> </ul>

Figure 2.5. Sample cue card and hints

Source: Boardman et al., 2010

# 2.3 CALL and the Tabletop Computer

CALL is defined by Egbert (2005) as language learning "in any context with, through and around computer technologies" (p. 4). CALL is concerned with studying and exploring how a certain technology can be used as a language learning tool (Chun, 2011, p. 663). The multidisciplinary nature of CALL requires it to drawing upon disciplines as different as linguistics, computer science, psychology and education (Chun, 2011, p. 663). Levy (1997) drew attention to the interdisciplinary nature of CALL as an area of study, listing other contributing disciplines that interact with CALL: psychology, human-computer interaction (HCI), instructional technology and design, artificial intelligence and computational linguistics.

The need for a theory to explain and understand CALL has already led researchers to invent new theoretical frameworks. Bax (2003) and Warschauer (2000, cited in Bax, 2003) are two of

the most widely quoted. Warschauer (2000) classified the development of CALL into three phases: *Behaviouristic/Structural* CALL, *Communicative* CALL, and *Integrative* CALL.

Stage	1970s-1980s: Structural CALL	1980s-1990s: Communicative CALL	2000s: Integrative CALL
Technology	Mainframe	PCs	Multimedia and Internet
English- teaching paradigm	Grammar: translation and audio-lingual	Communicate language teaching	Content-based, ESP/EAP
View of language	Structural (a formal structural system)	Cognitive (a mentally constructed system)	Socio-cognitive (developed in social interaction)
Principal use of computers	Drill and practice	Communicative exercises	Authentic discourse
Principal objective	Accuracy and flue	and agency ency	
		Source: Bax, 2003, p. 15	

Table 2.1: Warschauer's three phases of CALL

Bax (2003), later proposed an alternative model to the development of CALL: restricted CALL, Open CALL, and Integrated CALL (see Tables 2.1 and 2.2). The restricted CALL approach is based on a behaviourist framework where the focus is on simple tasks with rewards for correct answers (Davies et al., 2011), the types of task are closed drills and quizzes, and the teacher's role is monitoring. In open CALL, individual cognition is enhanced by the use of technology. The computer is considered as a tutor and a tool (Levy, 1997) able to correct students' responses. In open CALL, "attitudes to using computers were more open" (Bax, 2003, p. 22). Students' interaction through computers was still limited until the arrival of the web and CMC, which allowed Integrated CALL, and changed "learners' interaction with computers to interaction with other humans via the computer" (Kern & Warschauer, 2000, p. 11). This sociocultural shift had an impact on the nature of CALL, making it "lively, meaning-making [and] rich in discussion" (Bonk & Cunningham, 1998, p. 35). Bax's (2003) argument for a "more genuinely communicative" role of CALL since 1995, recognizes and supports this sociocultural paradigm.

The social construction of meaning is a fundamental Vygotskian premise in CALL research and design. Warschauer (2005, p. 42) listed three Vygotskian concepts to explain CALL: mediation, social learning, and genetic analysis. Mediation is considered central and crucial to human activities (Warschauer, 2005). How meditational tools such as computer artefacts can transform human behaviour and alter cognitive functions is significant (Warschauer, 2005). The second Vygotskian concept is social learning, which takes into consideration the cognitive potential which the social features of computer applications bring to learning activities (Mercer & Scrimshaw, 1993, cited in Gutiérrez, 2006, p. 233). Learning, according to Vygotsky, is fundamentally social, and societal activities are sources for the mediation of learning (Gutiérrez, 2006). Learning is seen not an isolated cognitive process but as a collaborative and socially constructed one (Vygotsky, 1978, 1986). Genetic analysis, or developmental analysis, is the third concept underlying CALL. Warschauer (2005) stated that it is possible to understand mental functioning only if its origins, histories, and developmental processes are understood. CALL teachers, researchers, and designers turn to theory as a foundation or a point of departure for "the decisions they make and the directions they follow" (Levy & Stockwell, 2006, p. 110) so that they can have a better view of the problem and limit what to focus on (Levy & Stockwell, 2011). Based on a sound theory, CALL researchers can decide on the type and nature of data needed, and can build, from previous evidence or premises, a sound structure for analysis and interpretation (Levy and Stockwell, 2011) of new technology environments such as the tabletop computer.

ucurruy		roles	Physical position of computer	
l drills Text es reconstruction	Correct/incorrect	Monitor	Separate computer lab	
Answering closed questions	l			
Minimal interaction with other students				
the computer	Focus of linguistic skills development	Monitor/ facilitator	Separate lab—perhaps	
Occasional interaction with other students	Open, flexible		devoted to languages	
Frequent interaction with other students	Interpreting, evaluating, commenting, stimulating thought	Facilitator Manager	In every classroom, on every desk,	
	1 drills       Text         es       reconstruction         Answering closed       questions         Minimal       interaction with         other students       ations         ations       Interacting with         s       Occasional         interaction with       other students         Frequent       interaction with         other students       Frequent         interaction with       other students	I drills       Text reconstruction       Correct/incorrect         a drills       Text reconstruction       Correct/incorrect         Answering closed questions       Answering closed questions       Correct/incorrect         Minimal interaction with other students       Minimal interaction with other students       Focus of linguistic skills development         S       Occasional interaction with other students       Focus of linguistic skills development         S       Occasional interaction with other students       Open, flexible         I       Frequent interaction with other students       Interpreting, evaluating, commenting, stimulating thought	I drillsTextCorrect/incorrectMonitori drillsTextCorrect/incorrectMonitoresreconstructionAnswering closed questionsMinimal interaction with other studentsMonitorationsInteracting with the computerFocus of linguistic skills developmentMonitor/ facilitatorsOccasional interaction with other studentsOpen, flexibleMonitor/ facilitatorIFrequent interaction with other studentsInterpreting, evaluating, commenting, stimulating thoughtFacilitator	

Table 2.2: Restricted, open and integrated CALL (Bax, 2003, p. 21). Five rows are replicated

out of eight.

skills work Mixed skills and system

Because of its unique combination of face-to-face and technology-enhanced communication (Almutairi, 2014; Kharrufa, 2010), the tabletop computer falls within the category of integrated CALL. To coincide with integrated CALL features, recent studies (Almutairi, 2014; Joyce-Gibbons, 2014; Kharrufa, 2010) have proved the tabletop computer's capability to support co-located interaction between students and the computer, and between students via the computer while interpreting, evaluating, commenting on and stimulating thoughts of others. According to Joyce-Gibbons' (2014) study as part of a SynergyNet project on multi-touch tabletops, the teacher's orchestration was more a facilitation of students' interaction in a learner-centred environment, described as "a brief transition orchestrated by the teacher between group and whole-class interaction and then back again" (Joyce-Gibbons, 2014, p. 1).

The tabletop computer is a platform that allows users to interact with one another face-to-face, at or with the tabletop, which becomes a collaborative learning tool. Recently, research has witnessed an increase in the use of tabletop computers, incorporated as an emerging technology into instruction in different ways and at different levels (Hornecker et al., 2008; Kharrufa, 2010; Rogers et al., 2008). However, there is still limited research about how this technology can contribute to scaffolding language learning and reading comprehension in particular. With regard to the physical presence of tabletop computers in integrated CALL, they have been used in many research projects (e.g. Heslop, et al., 2015; Joyce-Gibbons, 2014) and as digital tables for students.

As Kharrufa (2010) points out, the use of the tabletop technology has been associated with positive results in a variety of learning situations. Productive learning and effective enhancement of awareness of other users have been associated with the use of this technology (Hornecker et al., 2008; Rogers et al., 2008). A number of applications have also been produced specifically for language learning on the tabletop computer, including Matching Table, Poetry Table, Class Table (Morris et al., 2005), WordCat (Rick, 2009), and ReadIt (Sluis et al., 2004). However, despite the use of tabletop technology within the field of computer-supported collaborative learning (CSCL) and human-computer interaction (HCI), no research has

attempted to examine reading comprehension, the scaffolding process within collaboration, or scaffolded reading tasks with regard to reading comprehension on the tabletop computer. Furthermore, the three Vygotskyan concepts basic to CALL (mediation, social learning, and genetic analysis) have not been considered in any investigation, exploration, or design for the tabletop computer. This current study is the first to investigate interaction on the tabletop computer, using microgenetic analysis as one of the components of sociocultural theory.

#### 2.4 Chapter summary

This chapter provides a review of the relevant literature on scaffolding, reading models, computer assisted language learning (CALL) and reading, and the potential of tabletop computers to support scaffolded reading. It reviews definitions of scaffolding, and how the concept of scaffolding has been extended to include more complex learning environments. It considers the differences between embedded (static) scaffolding and contingent (dynamic) scaffolding, and discusses the concept of scaffolding within the sociocultural theory of learning. An overview of bottom-up, top-down, interactive reading models, and the CSR approach is also presented before concluding with a brief review of CALL and the tabletop computer.

The next chapter presents the research methods, data collection procedures, and data analysis that underpin this study.

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# CHAPTER 3: RESEARCH METHODOLOGY AND PROCEDURES

#### **Chapter 3: Research Methodology and Procedures**

#### 3.1 Introduction

This chapter begins with an overview of the methodology and continues with a description of the research design, participants, data collection instruments, the reading application design and research location, followed by a discussion of data analysis procedures and explanations of issues of validity and triangulation.

This is a case study using qualitative research methods to investigate and describe co-located interaction on a tabletop computer-based platform. The main goal of the research is to gain an understanding of the nature of tabletop computer interaction with regard to scaffolding collaborative reading comprehension in English language learners.

#### **3.2 Research Methods**

This study was mainly guided by questioning whether the tabletop technology can provide scaffolding for reading comprehension, and if so, how this might take place holistically. Qualitative research methodology was utilized because the situation under investigation is complex and context-dependent, and needs to be studied as it is and as it occurs in order to obtain insightful qualitative data which reflect students' practices of scaffolding when using the tabletop computer as a learning platform and a means of small-group communication. Silverman (2013) stated that "working in small groups has become a common feature of modern education. The exact nature of such 'learning' presents a clear and apparently under-researched topic tied to a recognizable social problem" (p. 49).

This case study used observation of video-recorded data of a small group of students reading collaboratively on the tabletop computer, and employed microgenetic analysis to obtain indepth data of students' practices of scaffolding during interaction with one another and with/via the tabletop computer. This helped to understand this social situation in greater depth and to obtain meaning from student participants in the study (Bogdan & Biklen, 2006) by ascertaining their views and their experience of tabletop computer-based reading. This allowed for a better understanding of the observed interactions and their multiple aspects, and reduces the risk of bias which could co-exist with single-source data.

#### 3.3 Case Study Design

In social research which requires in-depth understanding of social phenomena in order to confirm, refute or extend theories (Eckstein, 1975; Mitchell, 1983; Stake, 1995), the case study research design is a common one, because they "can penetrate situations in ways that are not always susceptible to numerical analysis" (Cohen et al., 2011, p. 289). According to Yin (2009), a case study is used to collect evidence about a certain phenomenon from various sources through investigation, exploration and description, via the employment of qualitative, quantitative or mixed methods.

In intervention studies in linguistics, this case study can be described as a qualitative singlecase design, as compared to an experimental design (Nunan, 1992). To determine what the case of this study is, I referred to Miles and Huberman's (1994) definition who states that the case is "a phenomenon of some sort occurring in a bounded context. The case is, "in effect, your unit of analysis" (p. 25), and to Baxter and Jack's (2008) questions they suggested to delineate the case under study: do I want to analyse (1) the individual, (2) a program, (3) the process, or (4) the difference between organizations? (pp. 545-546). In this current study, what is analysed is the 'process'. Therefore, the case here is the 'process' of scaffolding reading comprehension on the tabletop technology performed by ESL students. Boundaries to the setting are limited to the investigation of scaffolding strategies and system tools employed by ESL students to assist each other and the functions of such strategies and tools in their interlanguage development. These four students were also interviewed to investigate their experience and feedback about collaborative reading on the tabletop computer. (See 3.6 for more details about the research context).

Nunan mentioned an example of a single-case study by Schmidt (1983) of Japanese ESL students who were observed over three years. According to Nunan, the single case design has the capability to allow in-depth exploration and investigation of a case. The current study, as a type of case study, has the advantage of including direct observation and interviews (Yin, 2009).

#### 3.4 Research Questions

The purpose of the study and the research questions define the scope of the study. The study aims to contribute to the body of research on English language learning and scaffolded learning, more generally, examining and investigating how the capabilities of the tabletop computer environment may help in scaffolding English language learners' reading. It is hoped that the findings will contribute to understanding of how learners deploy the resources of the tabletopmediated collaborative reading context to construct meaning from the text and overcome comprehension breakdowns. According to van Lier (2000), "the environment provides a 'semiotic budget' ... within which the active learner engages in meaning-making activities together with others who may be more, equally, or less competent in linguistic terms" (p. 252). Not only technology itself but also "particular uses of technology" can affect the learning of language and culture (Kern, 2006, p. 200). Pedagogy, learners, and teachers if involved, have central importance in language learning (Kern, 2006). In Table 3.1, the research questions and research instruments used are presented.

#### **Thesis Question**

How can tabletop computers scaffold ESL reading comprehension?

#### **Research Questions**

- 1. How can an application be designed to scaffold students' reading comprehension on the tabletop computer?
- 2. What are the user strategies and the system tools that could scaffold students' reading comprehension on the tabletop computer, and what are the functions of these strategies and tools?
- 3. What are the students' experiences when reading on the tabletop computer?

To answer these questions, various instruments were employed to further understand the scaffolding process as it is applied by the tabletop computer, and students' practices and perceptions. Sessions on the tabletop were recorded in two ways: the tabletop screen recording using "SnagIt" screen capture software, and video and audios recordings of students' interactions around the tabletop. Group interviews were also used to elicit students' views about their experiences with the tabletop-based reading.

#### **3.5** Research Instruments

Table 3.1 below lists the research instruments used for each research question. These instruments are explained in the following sections in more detail.

No.	Research Questions	Instruments
1	How can an application be designed to scaffold students' reading comprehension on the tabletop computer? (addressed in chapter 4)	Iterative design of the DCSR collaborative reading application
2	What are the user strategies and the system tools that could scaffold students' reading comprehension on the tabletop computer, and what are the functions of these strategies and tools? (addressed in Chapter 5)	Audio and video recordings of students' interaction. Recording of activities on the tabletop computer screen/surface.
3	What are the students' experiences when reading on the tabletop computer? (addressed in Chapter 5)	Students' group interviews

#### Table 3.1: Research questions and research instruments

#### 3.5.1 The DCSR software

This study involves an iterative design of the tabletop application DCSR (Digital Collaborative Strategic Reading). Although DCSR is a learning platform for tabletop technology, it is also a research instrument that in this study was to answer the first research question, "How can an application be designed to scaffold students' reading comprehension on the tabletop computer?" Full details of the design process are given in Chapter 4.

### 3.5.2 Video and audio recording of students' interactions

According to Swain (2001) and Platt and Brooks (2002), video recording is a valuable instrument for collecting and analysing second language learning data. In this research, two cameras were used to record students' interactions, diagonally located on both widths of the tabletop computer where the best discernment of students' voices and interaction scenes could be obtained. Not only are video cameras able to record students' verbal communication, but they are also able to record non-verbal as well as on-screen communication. The video recordings proved of great value as they afforded a view of collaborative interaction and how it was carried out among students using both verbal and non-verbal strategies.

#### **Audio Recording**

Two additional audio recorders were placed on the facing corners of the tabletop computer and used to collect students' collaborative talk in order to compensate for any parts of the talk that

the cameras were unable to discern. One audio recorder of these two was also used to record group interviews.

#### **Tabletop-Screen Recording**

A computer software programme, SnagIt, which can run in the background of Windows, the operating system running on the tabletop computer, was installed to give a video account of every single activity on the tabletop surface.

#### 3.5.3 Group interview with students

Focus group interviewing can be defined as "an interviewing technique in which participants are selected because they are a purposive, although not necessarily representative, sampling of a specific population, this group being "focused" on a given topic" (Barbour & Schostak, 2005, p. 46). It is also defined as "a carefully planned discussion designed to obtain perceptions on a defined environment" (Kreuger, 1998, cited in Smithson, 2008, p. 358). Participants in a focus group are generally an interviewer or moderator, and six to twelve participants (Smithson, 2008). In this study, four students participated in five collaborative reading sessions throughout the intervention time. Group interview was conducted at the end of the interventions. Four students attended all five sessions.

The same four were interviewed as a group as well. It was important to interview them together because they did the reading sessions together and had gone through the same groupwork details and co-constructed their knowledge together. "One of the perceived strengths of focus group methodology is the possibility for research participants to develop ideas collectively, bringing forward their own priorities and perspectives" (Smithson, 2008, p. 359), and therefore interviewing them in one place, where they could hear one another, was likely to stimulate more valid responses. Group interviews are "relatively inexpensive to conduct, and often produce rich data that are cumulative and elaborative; they can be stimulating for respondents, aiding recall and the format is flexible" (Fontana & Frey, 1994, p. 365). Group interviews can be a valuable technique to elicit experiences and perceptions from students on a specific learning platform such as tabletop-based collaborative reading. The conducted group interviews helped me to see the collaborative learning sessions through the students' eyes.

#### **3.6 Research Context and Participants**

This study took place in iLab:Learn at Newcastle University. This laboratory is equipped with some of the most up-to-date emerging technologies, including a range of tabletop computers. The tabletop computer used in the study was the Touchscape. It can support simultaneous multi-touches and has a 47-inch LCD display with full HD 1920 x 1080 resolution. Its dimensions are 51 x 35 x 19 inches ( $130 \times 90 \times 50$  cm).



Figure 3.1. Research context and participants: the Touchscape tabletop computer in use

The four participants in this study were ESL students at an English language institute in the north-east of England; the institute assessed their level of English as between intermediate and upper intermediate. Their ages ranged from 20 to 32. They had come from different countries (one from Italy and three from Spain) and wished to undertake undergraduate or postgraduate studies, and were taking intensive English courses to fulfil the condition for admission to their prospective university programmes.

#### 3.7 Research Procedures

#### 3.7.1 The pilot study

Prior to conducting this research, a pilot study (Maslamani et al., 2012) was conducted with two groups of four ESL students each, in 2012. Both groups did five reading sessions in five weeks: one group did two sessions and the other group did three. The aims of the pilot study were (1) to make sure that both the reading application (DCSR) and the tabletop computer were ready for the main study; (2) to identify any problems that might occur while conducting a session, in order to solve them before the main study; (3) to test the digital data collection

instruments (audio recorders, video cameras and the screenshot software SnagIt); (4) to test, for the first time, the tabletop computer available in iLab:Learn; and (5) to make sure that the location was suitable and comfortable for the students.

Following the pilot study, I debriefed the students with questions aimed at addressing the five areas of concern noted above: (1) Did you feel comfortable working here? (2) What did you like in the place? (3) What did not you like? (4) Do you have any suggestions?

Based on the responses, I felt confident that the system was properly in place and ready for the main study. Their answers are summarized as follows: They confirmed that they felt comfortable. They said the chairs were comfortable and the room was quiet and clean. They did not like the location of the tabletop computer and suggested moving it from near the middle of the room, where it was near other desktop computers and a large meeting table, to a corner, which they felt there was a more relaxing and encouraging place to talk and discuss things. One thing they strongly suggested—and emphasized—was having a break in the middle of the session because the work was challenging and required a lot of effort. SnagIt, the screen recorder app, needed a break as well: after about an hour it could no longer save the video of the computer screen and gave an error message. SnagIt was tested twice after this occurred, first with a 70-minute session and then with a 40-minute session. SnagIt was able to save the 40-minute session but, for unknown reasons, was unable to save the 70-minute session, and so it was necessary to divide each session into two parts so that SnagIt could record and save them in full.

The pilot study provided a brief look at some areas of the project that required attention. It helped to reform the scope of the main study, the data collection plan, and the data analysis plan. The focus of the study narrowed from investigating the effectiveness of tabletop computers and the construction of meaning in general to a more refined and specific focus. The quantitative side of the study was abandoned because the results were not likely to reveal much about the effectiveness of tabletop computers in collaborative reading, given the small number of participants. The number of participants was limited by availability: it was almost impossible to recruit sufficient numbers of participants who could attend, for appropriate length of time, both the intervention classes (tabletop computer group) and control group classes (paper-based group). It was very difficult to find a representative sample size of at least 25 students for each group, willing to commit to attending all sessions. I found it more practical and less risky to shift to a qualitative study where the focus was on the process rather than on the product. This

approach aligned well with the general trend in research on CALL, which has become "less quantitative and more qualitative" (Kern, 2006, p. 202):

Whereas early CALL research generally sought out relatively simple causeeffect relationships between human-computer interaction and learning, current research seeks to understand complex relationships among learners, teachers, content, and technology within particular social and cultural contexts. Consequently, research on technology and language learning has broadened the theoretical perspectives it draws on. Although second language acquisition remains central, it now increasingly overlaps with literacy studies, discourse analysis, sociocultural theory, sociolinguistics, and anthropology (especially ethnographic methods). (p. 201)

In light of the observation of video data and preliminary and the somewhat brief analysis of students' collaborative reading on the tabletop computer in the pilot study (Maslamani et al. (2012)), many instances of scaffolding (mainly peer scaffolding) were observed; for instance, instances of comprehension checks, requests for explanation, requests for elaboration and corrective feedback, as well as of verbal and non-verbal prompts.

By the main study, the research questions had evolved to focus more specifically on how different communication actions (verbal strategies, non-verbal strategies, or system tools) can scaffold ESL students' language learning on tabletop computers. It was also decided, after the pilot study, to add group interview questions to the main study to hear the learners' views about their experiences with reading on the tabletop computer.

#### 3.7.2 The main study

#### 3.7.2.1 Data collection procedures

The study consisted of one tabletop group consisting of four students who completed five reading sessions together. Each session lasted between 45 and 70 minutes; the average time for each was about one hour: total time recorded was about five hours. When the group had finished the five sessions they were asked to take part in the group interview, which lasted about an hour. In every meeting, students performed one reading session. After the final session, I conducted the group interview to elicit students' experiences of the process and their views on the intervention they had been through.

Recording students' interactions involved several procedures: Before the session, I prepared the cameras, audio recorders, and the tabletop computer well in advance of the students' arrival. During the session, I announced to the students that I would sit away from them to allow them to work, and would not interrupt them at all. I encouraged them to ask me questions only if they had a problem.

Recording the focus group interviews was a lot easier than recording students' interactions, as it was conducted only once, immediately after the fifth reading session.

#### 3.7.2.3 Transcribing the data

Both main sources of data for the study, videos and interviews, were transcribed. The transcription of videos went through three stages: (1) transcription of spoken language to text; (2) illustration of non-verbal and on-screen behaviour that are important to the research topic; and (3) incorporation of video stills of non-verbal and on-screen behaviour into the transcription of the spoken language where necessary. Much effort went into temporally aligning videos of participants' spoken language and physical non-verbal behaviour with the relevant portion of on-screen behaviour using ELAN, and into adding video stills to the transcription. During collaborative work, much of the conversation was associated with varieties of non-verbal behaviour so the meaning of the interaction would only become clear to the reader through careful transcription or description. Video stills of students' interaction were a significant help as well, as they illustrated non-verbal behaviour.

#### 3.8 Data Analysis

This section describes the analysis approaches of the three main types of data in this study: (1) video and audio data collected from students' physical collaborative group work during reading sessions, (2) video data collected from recordings of the on-screen activities on the tabletop computer via SnagIt, and (3) audio data collected from students' group interviews. The first two types of data (the reading sessions) were examined using microgenetic analysis, while the third type is examined using thematic analysis.

#### 3.8.1 Analysis of reading sessions

Analysis of students' collaborative reading sessions involved two consecutive stages: the *first stage* answers the first part of the second question (what are the user strategies and the system tools that could scaffold students' reading comprehension on the tabletop computer) of the study in order to find out about the scaffolding 'user strategies' and the scaffolding 'system tools'. I carried out inductive analysis of scaffolding scenes and derived codes from the data. Codes were revisited and checked constantly for refining. Various coding sessions were conducted with a second coder (a PhD candidate of Applied Linguistics), which led to clarifications regarding defining codes. Microgenetic analysis of learners' interaction is used to examine the learning process and how learners exploit the learning resources of assistance and opportunities available to them, and how learning is mediated within the tabletop-based social context. Figure 2.1 shows the multiple forces and resources of assistance that come into play as students interact with one another and with the tabletop technology as parts of their whole learning environment. Microgenetic analysis of these episodes resulted in a 'taxonomy' of 'user strategies' and 'system tools' for scaffolding reading comprehension on the tabletop computer.

To answer the second part, the two frameworks of Wood et al. (1976) and Lidz (1991) were jointly used in *stage two* to categorize user strategies and system tools emerged from microgenetic analysis in *stage one*. This categorization resulted in a 'taxonomy' of scaffolding functions of user strategies and system tools.

*What is microgenetic analysis:* Microgenetic analysis stems from microgenesis, a sociocultural investigation of moment-by-moment interaction. Microgenesis is described by Gutiérrez (2008, p. 121) as "the study of the origin and history of a particular event" and by Wertsch as "a very short term longitudinal study" (1985, cited in Gutiérrez, 2008, p. 121). It investigates development by observing learning taking place within learners over a period of time. Microgenetic approach, within a sociocultural perspective, mainly focusses on the development and transition from a novice learner to a more capable learner, or from an other-regulated to a self-regulated learner as a result of social interaction with the teacher or more capable peers. Interaction between a learner and a supportive expert leads to more discussion and may gradually changes the learner's performance and allows him/her to accomplish with the help of an expert or a more capable peer what he/she cannot not accomplish alone. Donato (1998), who studied collective scaffolding during L2 planning sessions, asserted that "a microgenetic analysis allows us to observe directly how students help each other during the overt planning

of L2 utterances and the outcome of these multiple forces of help as they come into contact, and interact, with each other" (p. 42). With the help of video and audio recorders, this approach made it possible for researchers to uncover and gain a wider information about the dynamics of development via focusing on the process not the product.

Microgenetic analysis of reading sessions: Analysis of students' collaborative reading sessions involved inspecting the transcripts, alongside the video recordings, for (1) scaffolding system tools and (2) scaffolding user strategies in line with the microgenetic approach. This inspection draws on Vygotskian genetic approach where mediation is crucial for transformation from an interpersonal stage (constructing knowledge with the help of an expert or a more capable peer, or a system tool) to an intrapersonal one (knowledge is achieved). Such inspection aims to gain detailed understanding of the 'system tools' and 'user strategies' as mediations during the collaborative reading activity. It also considers the importance of different modes of interaction to "co-construct meaning and learning opportunities" (Gutiérrez, 2008, p. 120). As with Gutiérrez (2008), the focus of analysis was on "a specific aspect of microgenesis that appears to be crucial for driving the learner's second language (L2) forwards, and which I refer to as microgenesis affordance" (Gutiérrez, 2008, p. 120). During interaction between the learners and other resources in their environment, affordances of these resources arise, allowing learners to exploit learning opportunities, construct knowledge, and solve problems. Interaction in a social system is "dynamic rather than static [and] provides affordances for active participants in the setting, and learning emerges as part of affordances being picked up and exploited for further action" (van Lier, 2004, p. 8).

According to Warschauer (2005), beside mediation and social learning, genetic (or developmental) analysis is the third of Vygotsky's concepts which are relevant to understand CALL. Warschauer (2005) stated that it is possible to understand mental functioning only if its origins, histories, and developmental processes can be understood as well; and thus "we can only understand CALL when we place it in its broader historical, social, and cultural contexts" (p. 43). Microgenetic analysis is conducted in order to understand the 'process' of knowledge construction within the individual learners' zone of proximal development (ZPD) as a result of their social interaction with other more experienced learners sharing the same activity.

The data analysis is based on the way data are transcribed. What was transcribed were the verbal utterances made during the students' collaborative work. Students' non-verbal behaviour, including on-(tabletop) screen actions, were described, and at times photo-illustrated. As a case

study, which aims to describe how ESL students use verbal strategies, non-verbal strategies, and system tools for scaffolding, the units of analysis are episodes during which these students use different tools and strategies to solve a problem, "develop a specific skill, grasp a particular concept or achieve a particular level of understanding [or] goal they would not have been quite able to achieve on their own" (Panselinas & Komis, 2009, pp. 87–88). This present study will add a new dimension to the understanding of the relationship between peer scaffolding and learning by considering the newly emerging, and thus less researched, context of the tabletop assisted language learning environment.

#### 3.8.2 Interpretation of the transcribed data

Verbal, non-verbal, and on-screen actions may co-occur simultaneously or sequentially, and should be coded using appropriate categories. Some simultaneous behaviours may fit in the same or in different categories. In group work, the expectation is to find behaviours that are generated by two or more people simultaneously.

#### 3.8.3 Focus group interviews

The focus group interview was conducted to collect data about students' experience of collaborative reading on the tabletop computer. The interview session was conducted at the end of the fifth reading session. Appendix 8 lists the questions used in the interview. I arrived at these questions after reading interview questions about students' perceptions of implementation of CSR in a Taiwanese EFL context (Fan, 2009, p. 191). Although the scope of my study is different, I gained some insights from such questions while devising this study's interview question.



Figure 3.2. Thematic analysis of group interviews Source: Braun and Clarke, 2006, p. 87

Analysis of the data from the focus groups followed an inductive analysis approach (Glaser & Strauss, 1967). The thematic analysis followed the six stages suggested by Braun and Clarke (2006, p. 87): (1) becoming familiar with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing and refining themes, (5) defining and naming themes, and (6) generating theory and producing a report. In this study, producing a report was the option taken (see Figure 3.2). As shown by some of the arrows in Figure 3.2, there are certain stages in the process that have to be iterative.

#### 3.9 Validity and Reliability

### 3.9.1 Validity

According to Creswell (2009), qualitative validity is determined by ensuring that findings are accurate. The following validity procedures were used to ensure such accuracy and credibility in this study:

(1) **Data triangulation:** triangulation can be defined as a "validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study" (Cresswell & Miller, 2000, p. 126). Data were collected from multiple sources and through different procedures: (a) observation of students' behaviour, (b) recording of digital activities on the tabletop screen/surface, (c) synchronization of students' verbal, non-verbal, and on-screen behaviours, (d) students' interviews.

(2) **Prolonged engagement:** in this study, the data generated from students' interactions was examined and revisited using an iterative process over multiple sessions and over time. The analysis of interview data followed the six stages suggested by Braun and Clarke (2006), which involved iterative and repeated examination and analysis. These procedures added value to the convergence of data from multiple resources and contributed to the trustworthiness of research findings.

(3) Peer debriefing: this involves consultation with disinterested and experienced peers during the on-going research process (Cohen et al., 2011; Creswell & Miller, 2000). In this study, peer debriefers' assistance and feedback contributed to the prevention of researcher bias and to the consideration of other opinions and perspectives on different stages of the study. Peer debriefers in the study were, at the time, PhD candidates in Applied Linguistics in Newcastle University; now they are faculty members at different universities.

(4) **Pilot study:** this was carried out to enhance the validity of the research instruments (see 3.7).

#### 3.9.2 Reliability

In qualitative research, reliability or dependability is addressed differently than in quantitative research. In qualitative research "reliability can be regarded as a fit between what researchers record as data and what actually occurs in the natural setting that is being researched" (Cohen et al., 2011, p. 202). In quantitative research, reliability is established if the same methods and the same sample lead to the same findings (Cohen et al., 2011). For Yin (2009), to establish reliability in qualitative research, the research procedures and stages of the case under study need to be stated and documented; and in the present study, efforts were made to provide almost identical video versions of the students' behaviour during their interactions by the use of two cameras filming simultaneously the two sides. However, this was not guaranteed to provide identical transcribed written versions of talk because the transcriber's ears cannot catch every single sound produced by participants. This was anticipated and, therefore, in addition to the video recording, two audio recorders with a good audio quality were then added. The tabletop screencast video capture (SnagIt) was a third valuable data source as it provide a clear record of every single movement or behaviour performed by students on the tabletop surface.

#### **3.10** Ethical considerations

Prior to data collection, approval was obtained from Newcastle University to conduct the study. Before approaching potential participants, the English language institute where they were studying English as a second language was contacted. I visited the institute and provided the principal with information about the research plan, purpose of the study, methods, instruments, requirements, and place, time, and length of the study. Some questions and points about the nature of the study were also discussed during the meeting. I was then introduced to students to explain the study, and my contact information was given to those who showed interest in taking part. All potential participants were briefed about the purpose of the study and the data collection procedures. They were given the opportunity to ask any questions about the study and were informed that (1) they could withdraw from the study at any time and without giving any reasons; (2) they could ask any questions at any time before and during the study, (3) their background information, video recorded sessions and interviews would be stored in a password-protected file.

Participants agreed to their video recorded sessions being shown and discussed with people not part of the study. They also agreed in writing to their video recorded sessions being used for promotional purposes in websites, posters, or the press (see Appendix 6 for the consent form).

#### 3.11 Chapter Summary

This chapter has set out research methods, data collection procedures, and data analysis. It discussed issues related to research methods, case study design, research instruments, research context and participants, and research procedures regarding the pilot study and the main study and briefly highlighted data analysis criteria with regard to the interpretation of students' reading sessions and interviews. The chapter concluded with an account of issues of validity, reliability, and ethical considerations.

Details of the design process for the digital collaborative strategic reading (DCSR) software are presented in Chapter 4. In this study, the DCSR is used not only as a language learning platform but also as a data collection instrument.

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# CHAPTER 4: DIGITAL COLLABORATIVE STRATEGIC READING (DCSR)

# Chapter 4: Digital Collaborative Strategic Reading (DCSR): Adapting a Paper-Based Reading Activity to a Multi-Touch Digital Surface

#### 4.1 Introduction

This chapter answers the first research question: How can an application be designed to scaffold students' reading comprehension on the tabletop computer? The chapter explains in detail the capabilities of the tabletop computer for scaffolding reading comprehension. In other words, it investigates what the tabletop computer can offer English language learners with regard to supporting collaborative reading comprehension, or what tools can be embedded into a digital collaborative strategic reading (DCSR) system in order to support reading comprehension on the tabletop computer.

#### 4.2 The DCSR Design

This study involves the design of the tabletop computer application, DCSR, prior to data collection. DCSR is an integrated application which combines the strengths of traditional table collaboration, digital tabletop collaboration, and effective reading instruction; it is designed to facilitate co-located collaboration on the tabletop computer. A number of sketched paper prototypes, which formed the basis of a digital version of the CSR, were created before arriving at a final version of the paper prototype that was passed to the programmer and software developer, Philip Heslop, from Computing Science in Newcastle University.

DCSR is based on the CSR instructional approach, but it is not simply a digital translation of the paper CSR: it incorporates a series of improvements based on feedback from my PhD committee, with expertise in both Applied Linguistics and human–computer interaction (HCI). These focused on ensuring a smooth flow of interaction on the tabletop while retaining basic CSR principles and strategies. The design is also informed by key literature in HCI, such as Scott et al.'s (2003) guidelines for designing applications for co-located collaboration on digital tabletops, and the work of Dillenbourg and Evans (2011) and Kharrufa (2010). Walsh (2011) also influenced the design of what I name in this study "managerial tools" and "materials tools" of tasks, mirroring to some extent his managerial and material modes. Scott et al. (2003) provided useful design guidelines for applications for collaborative work on the tabletop computer, arguing that technology must (1) support interpersonal interaction, (2) support fluid transitions between activities, (3) support transitions between personal and group work, (4) support transitions between tabletop collaboration and external work, (5) support the use of physical objects, (6) provide shared access to physical and digital objects, (7) consider the appropriate arrangements of users, and (8) support simultaneous user actions. (p. 159)

Dillenbourg and Evans (2011, pp. 500–501) suggested ways in which the pedagogical flavour of tabletops can be captured: (1) tabletops are designed for co-location, in that multi-users can work together in the same place and at the same time and can see one another's work; (2) tabletop computers are social places designed to allow face-to-face multi-user collaboration; and (3) tabletop computers are designed to allow interaction with objects on the tabletop surface with hands or prostheses (e.g. electronic pens). In this study, prostheses are external (hard) multi-keyboards, as opposed to soft keyboards that can be embedded in a tabletop; (4) tabletop computers afford communication not only via talk but also through multiple modes such as gesture, gaze, and action. Dillenbourg and Evans (2011) summarized their positions as follows: "Desk(top)s are personal, table(top)s are social, and (digital) whiteboards are public" (p. 501). Management of the physical environment of the tabletop technology is similar to Walsh's (2011) managerial and materials modes.

Although the notion of scaffolding has been extended over time (see Section 2.2.2), the integration of scaffolding tools into tabletop computer-assisted learning platforms may compromise elements of scaffolding such as ongoing diagnosis, contingent support and fading (Puntambekar & Hübscher, 2005; Sinatra, 2014). To deal with this there are two mechanisms of embedded scaffolding integrated into the DCSR: (1) managerial and (2) material (described further in Section 4.2.4). Managerial scaffolds structure the task and provide workspace. Material scaffolds provide support for students to articulate ideas or explanations. They also refer to specific help provided in the form of a built-in dictionary, for instance.

# 4.2.1 Design goals

The DCSR design has two main goals: the provision of a digital teaching platform for scaffolding reading on the tabletop computer, and the provision of a digital tool to collect data and investigate the learning potentials of an emerging technology, i.e., the tabletop computer, for language learning in general and reading comprehension in particular.

# 4.2.2 Design stages

# 4.2.2.1 Observing paper CSR 1

Before designing the DCSR application, the paper version of CSR in action was observed in order to identify how this activity is carried out by language learners. Software designers are advised to "observe how people collaborate then build software that facilitates collaboration based on those observations, giving the users the 'tools' that are 'naturally' defined in face-to-face interaction" (Tang, 1991, cited in Kharrufa & Olivier, 2010, p. 44). This enables designers to determine how the software can best be designed to benefit users of the tabletop features, and to adapt teaching approaches for working on the tabletop computer while keeping the strengths of the CSR approach and making use of the learning potentials offered by the computer.

# Participants in paper CSR 1

Four participants recruited from an English language institute in Newcastle performed five paper CSR tasks on a regular table. Each task consists of a different passage for students to read collaboratively, following the CSR approach. Reading passages were no longer than one side of an A4 page. The paper CSR included expert roles (see Section 2.2.6) assigned by the teacher to each student during the activity.



Figure 4.1. Paper CSR group

#### Paper CSR (1) Instruments

The instruments used with paper CSR (1) are: (1) a regular table, (2) four copies of the reading passage no longer than one A4 page, (3) a print-out of cue cards to help students remember what they are supposed to do at each stage of the reading process. These guide the students through all strategies and stages of CSR, offering hints about what they should do next (Boardman et al., 2010; Bremer et al., 2002, Vaughn & Klingner, 1999), and (4) four pencils.



Figure 4.2. Sample of cue cards of hints

Source: Boardman et al. 2010

#### 4.2.2.2 Designing paper prototype 1

Hand sketches were created to illustrate the design ideas for the DCSR tabletop application (Figures 4.3, 4.4). Prototype 1 was designed after observing the students working with the traditional paper CSR (see Appendix 1).



Figure 4.3. Sample page from paper prototype 1



Figure 4.4. Second sample page from paper prototype 1

# 4.2.2.3 Observing Paper CSR (2)

After receiving feedback on prototype 1, I started preparing paper CSR 2. This was meant to be more interactive, as a "grouping" tool was integrated into the reading activity, particularly at the end of the stages of brainstorming, prediction, get the gist, and wrap up. In paper CSR 2, students wrote their ideas on coloured sticky notes; each student had a different colour (Figure 4.5).



Figure 4.5. Sample page from paper CSR 2. Sticky notes for grouping

Sticky notes were also used for writing difficult or unclear vocabulary or information (clunks) from the text, whether they did not understand it or they wanted to know more about it via fixup strategies (Figures 4.6., 4.7, 4.8).



Figure 4.6. Sample page from paper CSR 2 sticky notes, click and clunk stage



Figure 4.7. Students group notes in paper CSR 2



Figure 4.8. Grouped notes in paper CSR 2

# 4.2.2.4 Designing paper prototype 2

Prototype 2 was designed as an interactive PowerPoint. Although it was much easier and clearer for demonstrating design ideas (Figures 4.9, 4.10), it was more time-consuming than hand sketches (see Appendix 2).


Figure 4.9. Sample page from paper prototype 2



Figure 4.10. A second sample page from paper prototype 2

4.2.2.5 Designing paper prototype 3



Figure 4.11. Sample page from paper prototype 3 (See Appendix 3)



Figure 4.12. A second sample page from paper prototype 3

#### 4.2.3 Migrating paper prototype 3 into a digital prototype (DCSR)

The final draft of the paper prototype was approved for development by Philip Heslop, Senior Computing Officer at Newcastle University. The various digital prototypes of the application were tested for usability in the Culture Lab or iLab:Learn in the school of Education, Communication, and Language Sciences. Any software problems discovered were fixed. To organize the physical learning environment, the DCSR was embedded with tools for the management and use of learning materials. These tools, named managerial tools and material tools, are explained in more detail in the following sections.

#### 4.2.4 DCSR tools

The DCSR managerial and material tools are specific to the DCSR stages. Predetermined (embedded) *managerial* tools structure the various parts of the reading task and mediate both the digital reading process and reading comprehension. These tools include "add group" and "group", "trash", "private list of unknown words", "list of all unknown words" (public space), "list of all unknown words" (private space), "list of solved words" (public space), and "unknown word". These tools, as well as the DCSR stages, which are based on the CSR teaching approach, aim to provide a learning platform (i.e., DCSR) designed to provide scaffolding not only through the tools but also through interaction with peers and any materials in the entire tabletop-based environment. The main function of the managerial tools is to organize the physical learning environment, as is the case with Walsh's (2011) managerial modes, and to facilitate problem solving (Lidz, 1991).

#### 4.2.4.1 Material tools

The predetermined (embedded) *material* tools are similar to Walsh's (2011) materials mode. According to him, one of the pedagogical goals of the materials mode is "to elicit responses in relation to the material" (Walsh, 2011, p. 113). The materials tools are used to elicit responses in relation to the reading text and the instructions (materials) given. Both types of tool are intended to provide a social context for interaction with expert peers and with system tools, leading first to individual language development and then to the strategic processes (Donato, 1994) of reading comprehension. The materials tools, which are more related to eliciting students' responses, are "new note", "digital note", "text area", "add group", "group tool", "next strategy", and "fix-up strategies."

#### 4.2.4.2 Managerial tools

**Colour-coding** (managerial tool: to organise the physical learning environment). Certain tools have different colours (red, green, orange, and blue), one each for the four users around the tabletop. Digital notes are also colour-coded according to the students' choice of place at the tabletop: that is, a student who chooses the green side will have green digital notes and cannot write on any other coloured note.

**Input tools** (managerial tool: to organize the physical learning environment). Students use hard external keyboards placed one at each side of the tabletop computer to write their names at the beginning of each session, and to write their notes as they continue.

**Log-in** (managerial tool: to organize the physical learning environment, locate the learning temporally, pedagogically and spatially):

Students start the digital CSR (or DCSR) session by typing their names in the spaces provided by the system. Students are allocated places according to the colour they choose (red, green, orange, and blue) (Figures 4.13, 4.14).



Figure 4.13. Green user is typing name



Figure 4.14. Orange user is typing name

The "Done" tool. Students cannot start reading unless each one of them touches the middle of the circle in their personal area and the word "done" appears (Figure 4.15). The "done" tool concludes every stage, or sub-stage, in order to allow low achievers to finish a task without being controlled by high-achieving, faster learners. The "done" tool is managerial as it has the same pedagogical goal as a managerial mode (Walsh, 2011), but it also works as a transitional tool to the next stage. An important role for this tool is *fading* the scaffolding. All students need to agree to fade the scaffolding by touching the "done" tool (they all need to touch "done"); it implies that no further help is needed.



Figure 4.15. The "done" tool allows transition to the next stage

Colour-coding
Input tools
Log in
Done tool
Instructions
Private list of unknown words (Figure 4.27)
List of all unknown words—private space (Figure 4.29)
List of all unknown words—public space (Figure 4.30)
List of solved words—public space (Figure 4.30)

Table 4.1. Managerial tools

Table 4.2. Materials tools

New note Digital note Text area (Figures 4.16, 4.25, 4.27, 4.28, 4.31) Add Group (Figure 4.22) Group Tool (Figure 4.23) Next Strategy (Figure 4.30) Fix-up Strategies (Figures 4.32-4.36)

All stages of the DCSR have certain tools designed to allow students to go through the strategic and collaborative reading process as smoothly and as seamlessly as possible. Other managerial and material tools are explained in the DCSR stages described below.

#### 4.2.5 Stage one: preview

In the preview stage, students are required to skim the reading passage quickly to have a sense of what it is about (Figure 4.16).



Figure 4.16. Preview stage

Students read the text and scroll up and down using the arrows above the text (Figure 4.17).

The preview stage has the following tools:

**Instructions (managerial tool).** Students have the following instruction in their personal spaces on the tabletop in front of them: *This is the document we will be working with*. According to Walsh (2011), "in managerial mode, there are frequent repetitions, directives and instructions" (p. 114). This tool can work as both an instructional and a directive tool as it serves to direct students to the area on the tabletop where they are supposed to read the text quickly and superficially. It is also a technical invitation for students to participate in the reading task at that moment.



Figure 4.17. Scrolling buttons to move the text up and down

**The "text area" tool** (material tool). The text area allows any length of reading text. This feature saves ink and paper and allows students to focus on the task and not get distracted by the presence of papers and/or books, as would be the case if they were using a regular table.

#### 4.2.6 Stage two: brainstorming

When students try to connect their previous knowledge or experience with new information, they activate their background experience, which helps them understand what they are reading. Students write their ideas, using their existing knowledge of the topic in hand, and one idea per note, in colour-coded digital notes like post-it notes.



Figure 4.18. Brainstorming Stage

The brainstorming stage has the following tools:

#### **Instructions (managerial tool)**

- a. Write what you already know about the topic.
- b. Create one idea per note (Figure 4.19).



Figure 4.19. One idea per note

**The "New Note" tool.** This tool (Figure 4.20) tells students to create a new digital note to type into. According to Walsh (2011), one of the pedagogical goals of the materials mode is "to elicit responses in relation to the material" (p. 113), so this tool can be considered a material tool because it elicits responses in relation to the reading text and the instructions (materials) given. In other words, it requires students to write what they already know about the topic in the notes they make, after they follow the instructions and read the text.



Figure 4.20. How to make a new note

**Digital Notes** (material tools). The digital notes (Figure 4.21) are coloured in each users' colour. The system generates new empty notes ready for writing, based on the students' decisions to make a new note "to provide language practice around a piece of material" (Walsh, 2011, p. 113). Students use notes to provide written information about what they already know about the reading topic, providing their background knowledge about the text they skimmed in the preview stage. The colour-coded notes identify who writes what.

Digital notes encourage focus and concentration on the task. They help to make good use of space on the tabletop surface because they can be placed over one another, can be dragged easily, and there is no glue or notes blowing off the table (as there might be in the case of the paper version). These features of digital notes make efficient use of tasks time and the students' efforts.



Figure 4.21. Digital notes and "trash"

"Add Group" (grouping tool) Grouping notes according to common characteristics is easy with digital notes, which can be dragged into groups smoothly and easily. When notes are grouped, students can still access and read them (Figures 4.22 and 4.23). The grouping tool introduced to the design of DCSR is from Kharrufa's (2010) Digital Mysteries, to make students' thinking more explicit (externalization of thinking) and to guarantee their attendance to the content of notes. According to Leat and Nicholas (2000), "the physical act of moving a data item to join another to form part of a set, a causal chain or a link between factors has to be explained to the group and often justified. Reasoning has to be externalized, creating the conditions for shared reasoning" (p. 117). The grouping stage was not part of the paper version

of CSR, but was introduced to DCSR because of the positive empirical evidence associated with grouping as a technique to help understand students' thinking, and their abilities and inabilities with regard to the meaning they are trying to construct (Kharrufa, 2010). Grouping also emphasizes and enforces the strategic learning behaviour of students. The externalization of students' thinking is an intervention which is in line with Pressley et al's. (1996) claim that peers can offer proper help if they are able to pinpoint what other students know and do not know, or find confusing.



Figure 4.22. Grouping notes that share one idea using the grouping tool "add group"



Figure 4.23. The "group" tool allows group of notes written by different students to make a group

**The "Trash" tool.** This is used to throw away any written notes that their owners think are irrelevant or should be excluded for any reason (Figure 4.21). Kharrufa's Digital Mysteries uses a trash tool to delete notes, sticky tapes, and empty groups. In DCSR the trash is designed to allow for deletion of irrelevant notes and empty notes, if any, but students cannot delete groups.

#### 4.2.7 Stage three: prediction

In this stage, students write, in the form of notes, their prediction of what the text is about. When they finish writing their predictions, they put them in groups in the same way they did in the brainstorming stage. The tools in this stage are very similar to the ones in the brainstorming stage:

## Instructions

- a. Write what the document will talk about.
- b. Create one idea per note.



Figure 4.24. Instructions

Other tools in this stage are "new note", "digital notes", the grouping tool "add group", the "trash" tool, and the "done" tool.

## 4.2.8 Stage four: click and clunk

This is the stage when students monitor their understanding of vocabulary. This stage is repeated according to the number of paragraphs or sections in the reading passage (Figure 4.25).



Figure 4.25. Click and clunk stage

This stage has various tools for students to use:

**Instructions** (e.g., "Click & clunk" (Paragraph 1)—Read and select unknown words). While reading the text, students are required to touch any word they do not know (Figure 4.26).

CLICK & CLUNK (Paragraph 1) - Read and select unknown words...

Figure 4.26. Click and clunk—instructions

**The "Text area" tool**. The system accepts multiple touches for words in the reading text in the "click and clunk" stage. The system processes all the words that the students have touched (selected) and offers a package of fix-up strategies for each word. When a student touches a word in the text, it appears immediately in a list beside the text. This feature is available only in this stage.

## The "Private list of unknown words" tool

When a student touches a word the system puts the word in a private list in the personal colourcoded space of each student, just beside the reading text (Figure 4. 27). All students have their own list of words that they want the system to help with.



Figure 4.27. Students have their own lists of unknown words

## 4.2.9 Stage five: fix-up strategies

When students are "done" with their clunks, they move to fix-up strategies where the system offers a package of strategies to help clarify their unknown words.



Figure 4.28. "Truly": an unknown word to be processed

This stage involves the following tools:

Instructions: (e.g., Fix-up (Paragraph 1)—Use Fix-up strategies to understand words).

**List of words** that are perceived by students as problematic. Students can see this list in their personal spaces as well as in public space (Figures 4.29 and 4.30). The system combines into a single list all the unknown words identified by all of the students.

stand words	stand words	stand words	stand words
truly	truly	truly	truly
display	display	display	display
courageous	courageous	courageous	courageous
us	us	us	us
desire	desire	desire	desire
thrilling	thrilling	thrilling	thrilling

Figure 4.29. "List of unknown words" (personal spaces)

Other tools in this stage are the "text area tool", "list of unknown words" (public space), "list of solved words" (public space), and the "next strategy" tool: When a student touches the "Next Strategy" Tool, the system starts the five fix-up strategies, one by one.



Figure 4.30. Unknown words (left), solved words (right), and "next strategy" tool (middle).

**The "Unknown Word" Tool.** In the example below, the unknown word is "truly". This tool tells students the current word that the system is dealing with.

truch .	1	(New York of the second s	( inte		C.	1
	allow us to witness acts that can truly be described as courageous thriling beautiful and even noble. In an ncreasingly complicated world sports is still an area in which we can regularly witness	truiy display courageous us desire thrilling	Truly	<ul> <li>allow us to with can truly be des courageous thri and even noble, increasingly cor world sports is which we can re</li> </ul>	^ tess acts that scribed as illing beautiful . In an mplicated still an area in equiarly witness	truly display courageous us desire thrilling

Figure 4.31. The system lists unknown words in students' personal spaces

Other tools in this stage are the "done" tool and the five fix-up strategies: There are five fix-up strategies:

• Showing the sentence with the unknown word (Figure 4.32).

FIX-UP (Paragraph 1) -	Use Fixup strategies to under	stand words
And sports allow us to witr	ess acts that can truly be described as co beautiful and even nobleated	urageous thrilling

Figure 4.32. Strategy 1: showing the sentence with the unknown word

• Showing the sentences before and after the one with the unknown word (Figure 4.33).

FIX-UP (Paragraph 1)	- Use Fixup strat	egies to unde	erstand words
truly			
On the surface at least And sports allow us to wit . In an increasingly compli	athletes display many ness acts that can trul beautiful and even cated world sports is vitness a certain kind	of the classical qu y be described as n noble still an area in whi of greatness	alities of heroes. courageous thrilling ch we can regularly

Figure 4.33. Strategy 2: the surrounding sentences

• Showing students a sample of a word broken into prefixes, suffixes, and roots in order to remind them to look for such parts in the unknown word in hand (see figure 4.34).

P (Paragraph	1) - Use Fixup strategie	es to understand wor
Can the word I	be broken up into prefix, suffix	and root? for example:
	UNREBUILDABLE	
	can be split into: UN = not	
	RE = again Still	
	ABLE = capable of.	

Figure 4.34. Strategy 3: breaking down a word

• Showing an example of a word that is broken apart into smaller words (figure 4.35). The sample word is "relatively" and it is broken into other derivatives: relate, relation, and relative.



Figure 4.35. Strategy 4: showing word families

• Giving a built-in dictionary definition (Figure 4.36).



Figure 4.36. Strategy 5: dictionary definition

# 4.2.10 Stage six: get the gist

After students have solved all their vocabulary problems with the paragraph in the click and clunk and fix-up strategies stages, they read the paragraph or section of the passage closely, then individually write what they think are the main ideas in that paragraph or section; after this they discuss their ideas with each other and make groups of similar ideas (Figure 4.37).



Figure 4.37. Grouping

This stage makes use of many of the tools introduced in previous stages. The tools in this stage are as follows:

Instructions (Get the Gist (Paragraph 1)—Write the main ideas from the paragraph).

GET THE GIST (Paragraph 1) - Write the main ideas from the paragr

Figure 4.38. Get the gist: instructions

Other tools in this stage are "text area", "new note", "digital notes", the grouping tool "add group", "trash" and "done'.

## 4.2.11 Stage seven: wrap-up

During the wrap-up stage, students summarize on notes the main ideas of the passage in the form of questions and answers. Each note has one question and one answer. Students share notes and group similar ones in the same way in the previous stages (Figures 4.39 and 4.40).



Figure 4.39. Grouping: the wrap-up stage



Figure 4.40. Grouping: the wrap-up stage

## Wrap-up Tools:

## Instructions

a.Wrap-up—Write questions and answers about the document (Figure 4.41).

- b. Create one question per note.
- c. New Question



Figure 4.41. Wrap-up: instructions

#### **Digital Notes**

Digital notes in the wrap-up stage are used to write questions and answers. Students are required to create one question per note and to answer the question on the same note. This stage has the following tools as well: the grouping tool "add group", plus "trash", and done".

#### **Groups from previous stages**

The groups that students make in the brainstorming, prediction, and get the gist stages are introduced again by the system in the wrap-up stage (Figure 4.42). These groups present the summary that the students themselves built about the reading text.



Figure 4.42. The system saves groups created in previous stages and recall them in the wrapup stage

#### 4.3 Chapter summary

This chapter has attempted to answer the research question, how can an application be designed to scaffold students' reading comprehension on the tabletop computer? It has delineated the conception and birth of a digital language learning platform for scaffolding ESL reading comprehension. The design of the DCSR application involved design guidelines and supervision from experts in both Applied Linguistics and Human Computer Interaction. The design went through multiple paper and digital prototypes.

The chapter reviews how the DCSR was designed to exploit affordances of both the CSR approach and the tabletop computer in order to provide scaffolding through digital tools. It explains in detail the two main types of digital scaffolding tool: managerial and material. The managerial tools were designed to support the structure and organization of the digital reading task; the material tools were designed to display teaching materials and problem-solving strategies (fix-up strategies) and to enhance peer collaboration through certain tools such as digital notes and grouping. The design process and procedures and tools have been illustrated, where possible, with snapshots and figure captions.

An evaluation of the DCSR is included in the interview data (see Chapter five) via obtaining students' views about this application. Many themes emerged from the interview analysis: (1) positive views about DCSR, (2) negative views about DCSR, (3) a theme summarizing the order of fix-up strategies according to usefulness, and (4) suggestions for improving the application.

One more point which is worth mentioning here is how well the application worked. During the main study, DCSR and the tabletop computer worked very well. However, during the pilot study, SnagIt, the screen recorder app, was not able to save the video of the computer screen and gave an error message. SnagIt was tested twice after this had occurred, first with a 70minute session and then with a 40-minute session. It was able to save the 40-minute session but not the 70-minute session. Therefore, it was necessary to divide each session into two parts so that SnagIt could record and save them in full.

Before the pilot study, I tried the DCSR application myself several times. I used to sit in the iLab for hours doing the reading activity and going through all the stages of reading while trying all the system tools. All technical problems were reported to the programmer well before the pilot study. Snapshots of these technical problems are attached as Appendix 12.

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# CHAPTER 5: DATA ANALYSIS AND FINDINGS

## **Chapter 5: Data Analysis and Findings**

#### 5.1 Introduction

It is important in this section to restate the argument as well as the research questions and to indicate how the data analysis will answer them. Having answered the first research question in Chapter 4, this chapter will focus on the second and third research questions.

**Research argument:** This thesis argues that the tabletop assisted language learning environment, as a whole learning environment, can offer scaffolding for students' reading comprehension.

Thesis Question: How can tabletop computers scaffold ESL reading comprehension?

The following research questions were posed to investigate the phenomena:

**Research Question 1.** How can a computer application be designed to scaffold students' reading comprehension on the tabletop computer?

**Research Question 2.** What are the user strategies and the system tools that could scaffold students' reading comprehension on the tabletop computer, and what are the functions of these strategies and tools?

**Research Question 3.** What are the students' experiences when reading on the tabletop computer?

#### 5.2 Analysis of collaborative reading sessions

This section includes the data analysis, which directly deals with research question 2 (above)

#### 5.2.1 Analysis criteria

The data analysis aims to identify parts of the interaction that provide evidence of assistance gained through the interaction between learners, or with and through the tabletop computer. This analysis of collaborative reading comprehension on the tabletop computer goes through two main stages. The first stage identifies instances during which students use various scaffolding strategies and tools to "develop a specific skill, grasp a particular concept or achieve a particular level of understanding [or] goal they would not have been quite able to achieve on their own" (Panselinas & Komis, 2009, pp. 87–88). As small-scale research, data cannot be

representative for ESL students. Instances of scaffolding identified are illustrations of scaffolding in accordance with Panselinas and Komis (2009) definition of scaffolding.

In the following extract, Lada does not know the word "courageous" while her peers (Carl and Dim) are more knowledgeable about this word. In fact, they offer repetitive "support to ensure understanding" (Walsh, 2011, p. 64), the same way a teacher might.

Carl:	[courageous]
Lada:	[courageous]
Dim:	you know courageous↑
Lada:	I don't know courageous
Carl:	courageous just when you are it's like
Dim:	you don't you are not scared
Carl:	the opposite of scared [you can then many] face up
Dim:	[yeah the opposite of scared]
Carl:	you can face all the situations=
Dim:	=yeah usually heroes are courageous=
Carl:	=you are like a hero=
Lada:	=ah, so that you err=
Dim:	=for instance=
Lada:	you have for example I have to go, I don't know
Dim:	for instance I say you Lada come on in the cemetery during the night
Lada:	aa I am going to say yes because I am courageous $\uparrow$
Dim:	yeah, if you go there alone
Lada:	yes (.) [I am not afraid]

In the second stage, the data is analysed again to determine the functions performed by the scaffolding strategies and tools identified in the first stage. Scaffolding strategies and tools are categorized according to the six functions of Wood et al.'s (1976) framework and Lidz's (1991) twelve component behaviours of adult mediating instruction; thus, the data analysis examines the dialogue and identifies instances where learners or the system provide assistance during collaborative reading. The data is examined to identify the scaffolding strategies and tools and their functions when employed by learners to support their peers. This examination is not restricted to the use of the tabletop computer (including the reading application) and its artefacts only, but considers any other types of strategies or tools and even modes such as language,

gestures, etc. Figure 5.1 provides an overview of the scaffolding strategies and system tools identified in the data.



Figure 5.1. Taxonomy of user strategies and system tools

**Scaffolding strategies and system tools.** Following the microgenetic analysis, instances of scaffolding strategies and tools are identified through direct observation of the data. "A microgenetic analysis allows us to observe directly how students help each other during the overt planning of L2 utterances and the outcome of these multiple forces of help as they come into contact, and interact, with each other" (Donato 1994, p. 42). This microgenetic analysis is carried out from the sociocultural perspective, which recognizes the contribution that the whole learning environment (in this case, the tabletop-assisted learning environment) provides learners with strategies and tools to mediate students' reading comprehension.

**Scaffolding functions.** The study that first referred to scaffolding functions and is considered as a key reference in scaffolding related studies was that of Wood et al. (1976). These are the observed functions of the tutor as sources of scaffolding in their study:

- 1. Recruitment of interest in the task.
- 2. Reduction in degrees of freedom. This involves simplifying the task for learners, for example by decreasing the number of steps required to achieve the solution.
- 3. Direction maintenance. This involves keeping learners motivated and in the direction that helps them achieve the goal of the task.
- 4. Marking critical features. This involves giving emphasis or prominence to critical and relevant features of the task.
- 5. Frustration control. This involves providing learners with a less stressful, less threatening, and face-saving problem-solving environment.
- Demonstration. This function involves modelling solutions or idealization of required acts to be performed later by the learners. Demonstration may also involve help with incomplete answers so that the learner will imitate back in similar problem-solving tasks. (Wood et al. 1976, p. 98) (see Appendix 4 for more details).

These six functions offer learners motivational and cognitive support; the motivational scaffolding functions are recruitment, direction maintenance, and frustration control, and the cognitive scaffolding functions are reduction in degrees of freedom, marking critical features and demonstration (Belland et al., 2013). This analysis considers tabletop-assisted reading comprehension as a whole learning environment, including mutual assistance from peers, as a source of scaffolding. This whole learning environment involves peers approaching each other, sharing ideas and co-constructing ideas.

In addition, Lidz's (1991) twelve components are used as a scheme to observe learner–learner mediating behaviour, and to categorize learner–learner scaffolding behaviour (see Appendix 5). The main reason for using this scheme alongside Wood's et al. (1976) six scaffolding functions is to provide a more recent input for categorizing scaffolding functions than that of Wood et al. (1976).

Codes for the scaffolding 'user strategies' and the scaffolding 'system tools' emerged from the data due to unavailability of an existing coding scheme. Four main codes, verbal strategies,

joint verbal and non-verbal strategies, non-verbal strategies, and system tools, were generated (Figure 5.1). Each strategy or tool with its sub-strategies or sub-tools is explained and illustrated with examples in the following sections.

#### 5.2.2 Verbal scaffolding strategies

Verbal strategies consist of two strategies, speaking and reading. The speaking category has the following strategies: explanation, elaboration, procedural instruction, comprehension check, response to clunks (giving or explaining the meaning of a word, giving synonyms, and giving antonyms), spelling, feedback, translation, and interpreting a morphological form. The reading category has two forms: reading peers' notes aloud and reading one's own note aloud.

#### Speaking (S)

Speaking, as a language tool, took different forms: explanation, elaboration, procedural instruction, comprehension check, and response to clunk.

#### Explanation

During collaborative reading students spoke in English as a means of social interaction and a way to assist their peers while performing the task. Speaking as a language tool takes different forms; the first one is "explanation". In extract S1, Lada is reading a note she wrote on the tabletop computer (see Figure 4.21 for illustration). Dim questions "win gold", but it is not clear whether he does not know the meaning or is questioning something else. However, it is evident that Beta does not understand what Lada meant by writing "win gold" in her note. In line 7, Lada offers assistance to Dim and Beta and explains what she meant by "win gold" (sharing of experiences) with regard to the rest of the phrase she is reading, in extract S1, line 1.

#### Extract S1

The system tool directly involved in this extract is the "digital notes" tool (direction maintenance) (Figure 4.21).



1:

2:

- 3: Lada: ={the sport news are more focus in speculation} {the win gold is the
- 4: most important and [the society } ((reading notes)).
- 5: Dim: [win gold $\uparrow$
- 6: Beta: what is it  $\uparrow$
- 7: Lada: it's like you want only win the gold the gold medal ((sharing experience))

Line 1 shows that Lada's peers were looking at her notes while she was reading them (see the notes written by Lada in line 2). This shows their interaction with content on the tabletop (direction maintenance) as well with what Lada was reading out, thus involving several senses.

In extract S2, Lada opens a note but is not sure whether to write a sentence or a question. Her "no" is like a tag question, "haven't we"? Dim is busy typing in his note (direction maintenance) and does not reply immediately (extract S2, line 3). In order for Lada to achieve the task, she has to write a note (direction maintenance) so that she is able to join the grouping session. Although Dim does not offer immediate assistance, his help is important for Lada. He explains that she should not write a question but a note (sharing of experiences). A note in the task is interpreted by the students to be a simple phrase or sentence, except in the last stage, wrap-up, where they write questions and answers in the digital notes.

## Extract S2

The system tool directly involved in scaffolding in this extract is the "digital notes" tool (direction maintenance) (Figure 4.21).

1:	Lada:	but we have to do like a question and then $\dots$ no $\uparrow$ ((Lada is looking at
2:		Dim and asking him))
3:		(0.6)
4:	Dim:	no just write just notes just notes ((sharing experience))

In extracts S1 and S2, the scaffolding function of direction maintenance is achieved by the use of the digital notes as a system tool. Digital notes serve to keep students' focus on the goal of the task by writing notes about what they already know about the reading topic. The scaffolding function of sharing of experiences is achieved by the peer's explanation for clarification. Sharing of experiences through explanation serves to pass the experience or thought of the mediator to the learner (Lidz, 1991).

#### Elaboration

Elaboration is a spoken language tool of scaffolding. In line 5, extract S3, Lada explains what she wrote in the note that she read for the group in lines 1 and 2, about winning gold medals in sport competitions. In line 8, extract S3, Carl elaborates (sharing of experiences) on Lada's explanation by giving the example of a gold medal like those in the Olympics. In line 8 Carl elaborates further (offering meaning) (Lidz, 1991) by providing a more specific explanation of a situation where a gold medal is awarded. Digital notes are used to maintain direction towards achieving the task goal.

#### Extract S3

The system tool directly involved in this extract is the "digital notes" tool (direction maintenance).

1:	Lada:	={the sport news are more focus in speculation the win gold is the
2:		most important and [the society} ((reading notes)).
3:	Dim:	[win gold↑
4:	Beta:	what is it↑
5:	Lada:	it's like you want only win the gold the gold medal
6:	Carl:	the the gold medal gold medal=
7:	Lada:	=yeah
8:	Carl:	The Olympic kinds if you are first you win the gold medal

#### **Procedural instruction**

Procedural instruction is defined as the type of instruction that describes "how to carry out the task by explaining each step" (Eiriksdottir & Catrambone, 2011, p. 750). An example of a pedagogical procedure is Scardamalia and Bereiter's (1983, 1985, cited in Pea, 2004, p. 428) "procedural facilitation", as they call it, which was used as a technique to support students' writing activity. "Instructional scaffolding" is another term used by Applebee and Langer (1983) to describe support for reading and writing activities. In extract S4, line 1, Carl is giving procedural instructions (direction maintenance), by describing and focusing on one of the most important steps students should take to do the grouping task. His invitation (recruitment) to his peers to share the ideas they wrote in their notes is important when carrying out the grouping stage to "maintain goal orientation" (intentionality) (Lidz, 1991). However, at the same time, he announces that his note is about sport competition, hoping to find the same idea written by his peers as well; notes with the same or similar ideas will form a group. Carl's initiation of invitation and sharing of ideas encourages peers to tell each other the ideas they wrote in their notes (lines 3 and 6, extract S4). This invitation can be coded as a directive (Walsh, 2011); this directive is unique in that it can be for the benefit of both speaker and addressee.

In line 7, Beta is pointing at her note and Carl is making direct contact with the tabletop surface where the note is located. He is checking Beta's note to see if her note might fit into a group with his own note about competition in sport.

#### Extract S4:

The system tool directly involved in this extract is digital notes (direction maintenance).

1:	Carl:	So any ideas about the competitive the competitive in sport, someone
2:		think that sport is very competitive ((invitation))
3:	Beta:	yes
4:	Carl:	do you have some ((Carl is looking at Beta's note and Beta is pointing
5:		at her note))
6:	Beta:	the {sports world is changing} or no, it's not the same



# 7:

## Extract S5:

The system tools directly involved in this extract are

- The "digital notes" tool (direction maintenance).
- The "add group" tool (direction maintenance, recruitment).
  - 1: Dim: ok let's start reading ((procedural instruction-invitation))



2:

- 3: ((While Dim was inviting his peers to read the notes they wrote, Beta
- 4: touched the grouping tool in the middle of the screen.))
- 5: Lada: group....one ((she was writing the group name in the space provided6: by the system))
- 7: Dim: yeah
- 8: Beta: yes

In extract S5, line 2, students are supposed to read the notes they wrote before moving on to a more challenging stage, which is putting these notes into groups sharing a single idea. Beta doesn't wait for them to read the notes but acts upon Dim's instruction (direction maintenance, recruitment, intentionality) to do the reading by going one further step, touching the group tool in order to start the first group. Beta opens an empty group in order to drag similar notes to it. The design can allow students to open the group first or read the notes.

## Extract S6:

The system tools directly involved in this extract are

• The "digital notes" tool (direction maintenance).

1:	Carl:	andanybody hashas written about [kids <sup>+</sup> ((procedural instruction-
2:		invitation))
3:	Beta:	[maybe this one((inaudible))
4:	Carl:	yeah this is possible
5:	Lada:	I think this iseris notI don't say, use the kids but is likeer if
6:		somebody tell you, you have to do this, you are like alert and if you are
7:		young you can do something. You can eer
8:	Carl:	Yes they they have like aa kind of link=
9:	Lada:	=yes
10:	Carl:	ok but we
11:	Lada:	ah no ah no
12:	Carl:	Ok group 3, and your sentence ((procedural instruction-invitation))
13:	Beta:	I don't knowbecause I think they are the same as different reactions
14:		just specific [experiment
15:	Lada:	[so here
16:	Carl:	Ok its done.
17:	Beta:	Yes
18:	Carl:	Ok

The "add group" tool (direction maintenance, recruitment).

In extract S6, two examples of procedural instructions can be found (direction maintenance, recruitment, intentionality), in lines 1 and 12. In line 1, Carl asks if anyone wrote about children with regard to the topic. His invitation encourages students to look through their notes and initiates a discussion about what is similar and what is not; this forms one of the procedures leading to completion of the collaborative reading task. In line12 Carl gives another procedural instruction to his peers. They are invited to form a third group after they decide what notes are supposed to be in one group.

#### **Comprehension check**

•

A Comprehension check is a way to assess how well their peers understand a concept before moving to another part of the task (direction maintenance, task regulation, frustration control, intentionality). In the extract below the picture in line 1 shows the unknown word tool that displays the words the students do not know. The word under consideration, "courageous", for instance, is shown in the upper-left corner of the tool (see picture in line 1 below). To check Lada's understanding of the meaning of the word "courageous", Dim asks her (line 4) if she knows the meaning. His question is triggered by the "Unknown Word" tool that displays the word as unknown among the list of other unknown ones. The word "courageous" is the third to be processed by the system, and for which five fix-up strategies are later offered. Lada admits the gap in her lexical knowledge to Dim. From lines 7 to 20, Dim and Carl try to help Lada fill her lexical gap.

## Extract S7

The system tools directly involved in this extract are

- The "text area" tool (direction maintenance).
- The "unknown word" tool (recruitment, reduction in degree of freedom, marking critical features).
- List of all (public) unknown words in personal space (marking critical features) (Figure 4.31).

	FIX-UP (Pa	aragraph 1) - Use Fixup strategies to understand words
1:	cours	ageous v A truly display covageous cover that
2:	Carl:	[courageous]
3:	Lada:	[courageous <sup>†</sup> ] ((Both are reading from the screen))
4:	Dim:	you know courageous? ((assessing Lada's knowledge about the word
5:		"courageous"))
6:	Lada:	I don't know courageous
7:	Carl:	courageous just when you are it's like
8:	Dim:	you don't you are not scared
9:	Carl:	the opposite of scared [you can then many] face up
10:	Dim:	[yeah the opposite of scared]
11:	Carl:	you can face all the situations=
12:	Dim:	=yeah usually heroes are courageous=
13:	Carl:	=you are like a hero=
14:	Lada:	=ah, so that you err=
15:	Dim:	=for instance=
16:	Lada:	you have for example I have to go, I don't know
17:	Dim:	for instance I say you Lada come on in the cemetery during the night
18:	Lada:	aa I am going to say yes because I am courageous

- 19: Dim: yeah, if you go there alone
- 20: Lada: yes (.) I am not afraid

## **Response to clunks (verbal response)**

The data show that response to clunks has taken three forms: giving the or explaining the meaning of a word, giving synonyms, and giving antonyms (offering meaning). The first and second extracts below offer examples of the use of definitions and explanation of meaning, and a spoken language tool for scaffolding.

## **Definition/Explanation**

## Extract S8: Explanation of meaning (offering meaning)

The system tools directly involved in this extract are

- Instructions ("Read and select unknown words") (recruitment)
- "Text area" tool (recruitment).
- List of private unknown words in personal space (marking critical features)



- 1: 2:
- text for clunks. Dim initiated the talk about the "clunk" "came into terms"))
- 3: Dim: But er er {in time Pence come came to terms}



4: Beta: Yeah I have the same



- 5:
- 6: Dim: Like...they are said, she accepted it
- 7: Carl: Yes, you-know what [that ]is, she...she's happy with her name.
- 8: Beta: [Yes]
- 9: Lada: Yes

- 10: Carl: {in time Pence came to terms with her name} Came to terms is being
- 11: faced maybe, or...just happy or she has accepted, I think.
- 12: Lada: Yes. Came to t-

In lines 1, 2, and 3 in the extract above, Dim is reading his text in the clink and clunk stage for words or ideas he doesn't know. According to the conversation, "came to terms" creates a lexical gap for Lada but not for Dim. Dim and Carl are trying to explain the meaning (offering meaning) of "came into terms" for Lada in lines 6, 7, and 10. Beta, in lines 4 and 5, has the same phrase listed in her private list of unknown words (see Line 5).

#### **Extract S9: Explanation of meaning**

The system tools directly involved in this extract are

- Instructions ("Read and select unknown words") (recruitment)
- "text area" tool (recruitment).



- 2: Dim: witness (.) to to wit.. to wit.. to witness is being err.. to see like=
- 3: Carl: =witness [if you ]
- 4: Dim: [the crime] the witness are who will see ((Dim knows
- 5: the meaning but not sure))
- 6: Carl: if you (.) if you see something committing err a crime=
- 7: Dim: =ok ok ok

1:

- 8: Carl: you are the witness
- 9: Dim: ok ok ok

In line 2 of the extract above, Dim is explaining the meaning, but not with the aim of helping anyone. He is reading the word "witness" aloud; according to his own lexical information about the word, he explains its meaning in lines 2 and 4 (offering meaning). However, he is not sure about the meaning he is explaining. Carl contributes to the explanation of the meaning to by adding further clarification in lines 3, 6, and 8 (offering meaning).

## Extract S10: Offering antonym-related vocab help

The system tools directly involved in this extract are

- Instructions ("Use fix-up strategies to understand words") (recruitment)
- The "unknown word" tool (Figure 4.31) (recruitment, reduction in degree of freedom, marking critical features)

	FIX-UP (Pa	aragraph 1) - Use Fixup strategies to understand words
1:	cours	allow us to without a set that
2:	Carl:	[courageous]
3:	Lada:	[courageous]
4:	Dim:	you know courageous↑
5	Lada:	I don't know courageous
6:	Carl:	courageous just when you are it's like
7:	Dim:	you don't you are not scared
8:	Carl:	the opposite of scared [you can then many] face up
9:	Dim:	[yeah the opposite of scared]

This extract shows another scaffolding tool that becomes evident during tabletop-based collaborative reading. Students here use antonyms as a language tool to fill their peers' lexical gaps (offering meaning) and help to understand the meaning of unknown words. Through his comprehension check in line 4, Dim finds out that Lada does not know the meaning of "courageous", as she admits in line 5. In line 7 Dim uses the antonym of the word to clarify its meaning for her (offering meaning).

## Extract S11: Offering Synonym

The system tools directly involved in this extract are

- Instructions ("Use fix-up strategies to understand words") (recruitment)
- The "unknown word" tool (recruitment, reduction in degree of freedom, marking critical features).
- Use of the first fix-up strategy: display of the sentence with unknown word (Figure 4.32) (offering meaning, frustration control, demonstration, marking critical features).

FIX-UP (Paragraph 1) - Use Fixup strategies to understand words... truly

1:

2: Lada: {truly be describe}

- 3: Carl: truly is like really ((offering possible synonym))
- 4: Dim: yeah
- 5: Beta: really?
- 6: Dim: that's right

Giving synonyms (offering meaning) is another language scaffolding tool that the data show. In line 3 Carl gives the synonym "really" for "truly". Dim confirms Carl's contribution in two places (lines 4 and 6). In line 2 Lada is reading the first fix-up strategy, in which the system extracts the sentence with the unknown word from the text and displays it in the student's personal space, so that the meaning can be guessed from the context of the sentence.

## Spelling

#### Extract S12:

The system tool directly involved in this extract is "digital notes" (direction maintenance).

1:	WHICH IS TH SPORT THAT TRAMP	
2:		(0.8)
3:	Beta:	trampus $\uparrow$ ((Looking at Carl and trying to guess the word "tramp" and
4:		seek his help))
5:	Carl:	tramp
6:	Beta:	tramp↑
7:	Carl:	tramp
8:	Beta:	((inaudible))
9:	Carl:	tramp, t-r-a-m-p ((giving spelling to help for pronunciation))

In the extract above, Beta is writing a note (line 1). She pauses for 0.8 seconds before writing "tramp", then looks at Carl and incorrectly pronounces the word "tramp" with a question intonation (see line 3). In the same line, Beta pronounces the word aloud but fails to pronounce "tramp" correctly. Her incorrect pronunciation causes Carl to offer help and give her the correct pronunciation in line 5, repeated line 7. In line 9 he gives the spelling as a scaffolding tool to help Beta to pronounce and write the word "tramp" in a correct way (marking critical features).

## Extract S13:

The system tools directly involved in this extract are

- Instructions (Brainstorming—"Write what you already know about the topic") (recruiting)
- "Digital notes" (direction maintenance).



In the above extract, students are writing notes on what they already know about the reading topic. Beta wants to write "effort" but does not know the English word for it. Her peer is able to speak Spanish, so she asks him if he knows the English word for "esfuerzo" to put it in her note (marking critical features and offering meaning).

#### Feedback

#### Extract S14: Positive

The system tools directly involved in this extract are

• Instructions ("Use fix-up strategies to understand words") (recruitment)

• The "unknown word" tool (recruitment, reduction in degree of freedom, marking critical features).

	FIX-UP (Pa	aragraph 1) - Use Fixup strategies to understand words
1:	cour	ageous v A truly display display courageous
2:	Carl:	[courageous]
3:	Lada:	[courageous]
4:	Dim:	you know courageous↑
5:	Lada:	I don't know courageous
6:	Dim:	for instance I say you Lada come on in the cemetery during the night
7:	Lada:	ah I am going to say yes because I am courageous $\uparrow$
8:	Dim:	yeah, if you go there alone ((positive feedback))

In line 8, Dim gives implicit positive feedback to Lada; he means that if she goes to the cemetery alone at night, she is courageous. He gives her positive feedback that indicates that she knows the correct meaning of the word "courageous", thus highlighting what is important to notice (Lidz, 1991).

#### **Extract S15: Corrective**

The tool directly involved in this extract is the use of the second fix-up strategy: display of the sentences before and after the one with the unknown vocabulary, plus that sentence (Figure 4.33) (offering meaning, frustration control, demonstration, marking critical features).

- Beta: ah.. what is this? ((pointing at the 2<sup>nd</sup> fix-up strategy))
   FiX-UP (Paragraph 1) Use Fixup strategies to understand words...
   Fix-UP (Paragraph 1) Use Fixup strategies to understand words...
   On the surface at least athletes display many of the classical qualities of heroes. And sports allow us to witness acts that can truly be described as courageous thrilling beautiful and even noble... In an increasingly complicated word sports is still an area in which we can regularly witness a certain kind of greatness
   Dimy. (on the surface at least athletes display at parts) (("'display." was prop.
- 3: Dim: {on the surface at least athletes display} (("display" was pronounced as
  4: "displace"))
- 5: Carl: display ((correcting Dim's pronunciation)) ((corrective feedback: correcting pronunciation))
In line 5 in the extract above, Carl gives an instant corrective feedback to Dim who pronounces "display" as "displace". According to Lidz (1991), Carl is highlighting what it is important to notice (offering meaning). Dim is reading hints on a digital fix-up strategy (Extract S15, lines 3, 4, 5) designed to scaffold text comprehension. In the extract below, Carl again corrects Dim's pronunciation, this time for the word "bystanders" that Dim pronounced as "beestanders".

# Extract S16:

The system tools directly involved in this extract are

- Instructions ("Read and select unknown words ")(recruiting)
- The "text area" tool (recruiting)
- List of private unknown words in personal space (marking critical features)

CLIC	K & CLUNK (Para	graph 1) - Read a	and select unkn	own words
1		v olds in a room. some children	The adult told she was leaving	Journal
Dim	: "bystander	rs" ((pronounc	ed as "beesta	inders")) ma
	that'sst	olethings?		
Beta	: ((laughing	))		

5: Carl: ok "bystanders" ((Corrective feedback: correcting pronunciation))

This extract offers another example of corrective feedback. Carl in line 5 corrects Dim's pronunciation (line 2) of "bystanders". Carl again is contributing to the understanding of meaning by highlighting correct pronunciation as an important thing to notice.

# Translation

# Extract S17:

The system tools directly involved in this extract are

- Instructions ("Use fix-up strategies to understand words") (recruitment)
- The "unknown word" tool (recruitment, reduction in degree of freedom, marking critical features).

FIX-UP (Paragraph	1) - Use Fixup strateg	gies to unde	rstand word
courageous		Α	truly
	allew us to with a	es a sta that	courageous

1:

2:	Dim:	you know courageous↑		
3:	Lada:	I don't know courageous		
4:	Beta:	but it's the same in Spanish I think		
5:	Carl:	yeah [Spanish it is ] the same		
6:	Dim:	[yeah in er in er in] in Italian [it is] the same coraggio		
((giving a translation from L1))				

#### Extract S18:

The system tools directly involved in this extract are

- Instructions ("Write what you already know about the topic") (recruitment)
- "Digital notes" (recruitment)



Translation is a spoken scaffolding tool that learners use while explaining the meanings of clunks (offering meaning). In the first extract, Dim provides a translation tool to scaffold students' construction of meaning (Extract 17, line 6) with regard to the word "courageous". In

the second extract Dim and Carl offer simultaneous help to Beta; they offer help consecutively in lines 3 and 4.

# **Morphological form**

### Extract S19:

The system tool directly involved in this extract is the fifth fix-up strategy: the built-in dictionary (offering meaning, frustration control, demonstration, marking critical features).







Another type of spoken scaffolding tool revealed through the data is related to the morphological form of the unknown word. In line 6 of extract S19, Carl is explaining the meaning of "less" as "un", in order to clarify the meaning of the word "selflessness" that contains the morpheme "less". Carl is marking critical features (here "less") of the word "selflessness" that helps his peers to understand the meaning.

In the second extract, the target vocabulary, that students are trying to construct meaning for, is "truly". Beta (line 1 of the second extract) and Lada (line 2 of the second extract) list "truly" among the words they have problems with. Lada refers to the root "true" of the word "truly" to try to determine its meaning. Both Dim and Carl confirm her statement and agree that "truly" comes from "true".

# Reading (R)

The data show reading is a scaffolding tool. This tool takes two forms: (1) Reading peers' notes aloud and (2) reading one's own notes aloud.

Reading peers' notes aloud

# Extract R1:

The system tool directly involved in this extract is "digital notes" (direction maintenance)

- ((Beta is reading 1: Beta: {sport can show some ..} 2: Carl's note)) (reading aloud peers' note from the screen)) 3: Carl: no, no, sorry, so sorry, it's not, it's this... SOMETIMES PEOPLE IS NOT FAIR AND THEY DO TRAMPS SOME AHTLETE BEHAVE BADLY NEW RULES FOR CONTROLING PROFESSIONALS SPORT 4:
  - ((Carl removed the note and put another one that reads
- "sometimes people is not fair and they do tramps")). 5:

# Reading one's own notes aloud

Extract R2:

The system tool directly involved in this extract is "digital notes" (direction maintenance)

1:	Dim:	{The relation between people and their own names, like if they accept			
2:		it if it causes problems to them}			
		SOME PEOPLE DONT			
3:	Beta:	{Some people don't like his name for different reasons}			
4:	Carl:	We can do like a group here.			
5:	Beta:	((Spanish))			
6:	Dim:	More or less it's people that is not happy with their names so.			
7:	Beta:	Yes we [can] put in the same no?			
8:	Lada:	[True]			
9:	Dim:	Yeah. What you think, that yours, your opinion is, your opinion fits			
10:		better with our			
11:	Carl:	Yeah, yeah because it's like the relation between umm			
12:	Dim:	Ok.			

In the first extract and during the grouping task, Beta is reading Carl's note from the tabletop screen; the note is already in a group. Her reading draws his attention to the note again and he has another look at it. He decides that the note is not suitable for the idea they want to make the group for, and he removes it from the group and drags another one in instead.

The second extract shows examples of students reading their own notes and how this reading helps other students to put notes in groups. For instance, in line 4 Carl is able to discover that the notes read by Dim and Beta are similar and share an idea. He also notices that his note

(There was a group of three similar notes is possible. Reading notes, whether their own or their peers', allows students to share experiences (Lidz, 1991), and ideas, and make their thoughts and ideas externalized and visible to others.

Figure 5.2 below summarizes verbal scaffolding strategies identified in the data. Figure 5.3 illustrates scaffolding functions of these strategies according to widely quoted schemes in the literature of scaffolding.



Figure 5.2. Verbal strategies



Figure 5.3. Scaffolding functions of verbal strategies

#### 5.2.3 Joint verbal and non-verbal strategies

#### **Pointing and Commenting (PC)**

4: 5:

6:

7:

9:

#### **Extract PC1: Clarifying Instructions**

The system tools directly involved in this extract are

Instructions ("Brainstorming: Write what you already know about the topic") (recruiting) "Digital notes" (direction maintenance)

"New note" (direction maintenance, recruiting)

1:	Carl:	It is just we have to write what we already know about this world, not,
2:		it's not like a summarize, it's what you already know, ok ((Carl was
3:		pointing at the instructions on the screen))



```
8:
         Dim:
                mmh yeah (0.7)
```



ok (.) so, can delete (.) all of this ((this=the note he wrote in line 9)) 10: Dim:



This extract is taken from a brainstorming stage where students are supposed to write what they already know about the topic. In lines 1-4, Carl is clarifying instructions (recruitment, marking critical features, direction maintenance) using spoken language accompanied with pointing in order to emphasize the goal of the instructions. As shown in line 4, Beta and Lada are looking at the instructions to which Carl is pointing. Dim is looking at Carl's face while he clarifies the instructions. Carl's pointing and commenting on the instructions make Dim think about the instructions again and decide that he should change the note he has written. He goes back to the note he already wrote (see line 9), and writes two notes instead (see line 11).

#### Extract PC2: Help in grouping notes

The system tool directly involved in this extract is "digital notes" (direction maintenance)

1: Lada: I think {the athletes of nowadays are machines} and yours

2:	((Lada is pointing at Beta's notes while speaking))
3:	
4:	Carl: and {the world sports is very competitive}
5:	Dim: yeah=
6:	Lada: =yes

In this extract and in the extract below, the simultaneous use of verbal and non-verbal strategies is exemplified by pointing at peers' notes and commenting in order to offer support to complete the grouping task (recruitment, marking critical features, direction maintenance). In line 1 of the first extract, Lada simultaneously uses pointing and commenting as scaffolding strategies to put notes in groups according to their similarities and differences. Lada means by "yours" in line 1 that her note and Beta's note could match.

In the second group below, scaffolding through pointing and commenting is employed again for grouping notes (recruitment, marking critical features, direction maintenance). Carl points at the empty group after Lada reads her note, and other students read their notes as well. At the same time as he points, he urged his peers to start making the first group out of the notes they have so far. The first empty group is ready to receive notes (see line 3).

# Extract PC3: Help in Grouping Notes

The system tools directly involved in this extract are

- "Digital notes" (direction maintenance)
- The "Group" tool (Figure 4.23) (recruitment, marking critical features, direction maintenance)
  - 1: Lada: and {the win gold is the most important}=



- ((Carl was also pointing at the empty group))
- 3: Carl: =the first group
- 4: Lada: I think

2:

- 5: Dim: yeah
- 6: ((Lada dragged two of her notes to the group))
- 7: ((Then Carl dragged his note to the group))

User strategies	∣⊖⊡	Joint verbal & non-verbal strategies	⊖ → Pointing & commenting	Clarification of instructions
-----------------	-----	---	---------------------------	-------------------------------

Figure 5.4. Joint verbal and nonverbal scaffolding strategies



Figure 5.5. Scaffolding functions of joint verbal and non-verbal strategies

# 5.2.4 Non-verbal strategies

# Pointing without commenting (PnC)

#### Extract PnC1: Help in grouping notes

The system tools directly involved in this extract are

- "Digital notes" (direction maintenance)
- The "group" tool (recruitment, marking critical features, direction maintenance)
  - Dim: {People especially in big cities work very fast work and don't take care
     about other people}
  - 3: Carl: Yes



4:

5:



6: Beta: {The following reactions in a specific situations, experiments with7: people in a specific situation}

In this extract, Carl is helping Dim to do grouping after all the four students have read their notes aloud. After Dim finishes reading his note to the group, Carl points at Dim's note to non-verbally indicate that Dim should start grouping by dragging the note to the empty group they have made (line 4) (recruitment, marking critical features, direction maintenance). Both Dim and Carl drag their notes to the group (line 5). Carl's gesture (i.e., pointing) helps to expedite the grouping session in the stage they are at.

# Extract PnC2: Help in grouping notes

The system tools directly involved in this extract are

- "Digital notes" (direction maintenance)
- The "group" tool (recruitment, marking critical features, direction maintenance)
  - 1: Lada: {There are lots of strange names and parents don't realise about the
  - 2: jokes in the school}



((Carl is pointing at his note, looking

- 4: at Lada to indicate that her note agrees with his))
- 5: Lada: {and now this is typical name your child like a famous person}

Extract PnC2 shows another example where pointing is helpful in the grouping session. In this example, Lada is reading her note for the group so that they know what her note is about. The screenshot in line 3 shows Carl pointing at his note and looking at Lada, to indicate that the note she is reading is similar to his, and that it is possible now to make a group.

# Extract PnC3: Help in grouping notes

The system tool directly involved in this extract is "digital notes" (direction maintenance)

- 1: Carl: Ok. Ok, I think the comment will talk about {some people who has
- 2: decide change their name because they were not happy with them}.
- 3: {How some names determinate a life}
- 4: Lada: Ok. {Psychology advice of character of people depends on the names}



5:

3:



Extract PnC3 also shows how pointing without talking can offer scaffolding. Carl hears Lada's reading of her note in line 4. In line 5 he checks her note and then his own, to see if they are similar or not.



Figure 5.6. Non-verbal strategies



Figure 5.7. Scaffolding functions of non-verbal (user) strategies

#### 5.2.5 System/technical tools

In the previous extracts, students are seen making use of a variety of system tools such as digital notes, grouping tools (group tool, add group), text area tool, unknown word tool, list of unknown words, and instructions. Their use of fix-up strategies is discussed in the next section.

#### Fix-up strategies as system tools: response to clunks

In the following extract, students make use of fix-up strategy tools as system tools in order to help them get the meaning of the word "bystanders". They go through the following tools: unknown word (recruitment, reduction in degree of freedom, marking critical features), next strategy (recruitment), and the five fix-up strategies which have the scaffolding functions of offering meaning, frustration control, demonstration, and marking critical features. In lines 1-2, Lada doesn't know the meaning of the word "bystanders" and asks her peers about it. No one gives her an answer or is able to give an answer. Carl, in line 4, calls for the next strategy tool (recruitment) (see line 6). Dim responds immediately and touches the tool in order to receive help from the system. Dim takes the lead in moving from one fix-up strategy to another; he rushes to reach the dictionary without spending time guessing the meaning via other fix-up strategies.





- 29: Ok.
- 30: Lada: ah so...was something....err...someone was looking in the....in the31: street?



Figure 5.8. System/technical tools involved in scaffolding



Figure 5.9. Scaffolding functions of system/technical tools

#### 5.3 Analysis of Student Interviews

In order to triangulate the data sources for the current study and to shed further light on scaffolding behaviour in the tabletop-assisted language learning environment, it was important to obtain students' views about this learning environment and to hear their voices with regard to the nature of the assistance they received or performed. The students interviewed were the same four students whose interaction was analysed above. At the time of interview, they were studying English as a second language in one of the English language institutes in England.

The interviews sought to find out about three main predefined themes or related issues with regard to scaffolding during collaboration on the tabletop computer; the questions were divided into categories corresponding to these themes. The first set asked about students' views about the reading programme (DCSR), the second set was related to group discussion, and the third was about the tabletop computer. Many themes emerged based on the thematic analysis of the students' views. The reading programme set presented three themes that emerged from the

interview analysis, both positive and negative views about DCSR and a theme summarizing the order of fix-up strategies according to usefulness. The group discussion set included two themes that emerged from the analysis of the interviews: individual text comprehension strategies and group text comprehension strategies. The tabletop computer set provided two themes: advantages and disadvantages of the tabletop computer. A fourth group of themes involved suggestions for improving the programme (DCSR). Details of each group are provided below.

# 5.3.1 Emerging themes related to the reading programme (DCSR)

#### 5.3.1.1 Positive views about DCSR

Analysis indicated that students had positive views about the reading programme. They viewed the DCSR as helpful in the following ways:

• DCSR changed the way students read:

When I asked students if the reading programme had changed the way they read (Appendix 6, lines 291-294), positive views were revealed:

P3: "last Thursday I was reading a magazine just for one session and I tried to do the method just read a paragraph and keep in my mind main sentence".

*P3: yeah I tried it. ...Me: did it help you?Did you find it helpful? ... P3: yes because ok, you can understand the meaning ... etc.* (See Appendix 6, lines 319, 320)

This student tried the reading programme method and found it helpful

*P4: For example, read the paragraph for paragraph separate and trying to understand paragraph. Mark the words that I don't know what's meaning.* 

Unlike her earlier reading method, this student focused on paragraphs and their main ideas and found it useful.

• It enhanced understanding of paragraphs

DCSR is seen as helping the students understand the paragraph content by encouraging them to read the same paragraph several times within the reading task.

P3: This method is good to remind because you are, we can say, you are insisting on the same paragraph once, and twice and three times. So in the end, you are able to remind a lot of things, and understand more things than in the first time. • It enhanced retention of vocabulary:

P4: For me, yes, because I study some words I don't know, I study, if you do or you speak or do a sentences with this vocabulary, in terms of writing, I don't know, you use.

P2: you will keep in mind.. it's easier to remember, to keep in the mind

These students talked about how the use of different techniques such as practising speaking the new word, using it in sentences and using it in writing, enhanced retention of new vocabulary.

• It helped to understand the text:

P1: I think that it's other method to do the reading, one more. But it's ok I think, because you go step by step, and read paragraph for paragraph. So I think that it's good because it's easy to understand the text.

• It supported thinking skills

Students' positive views about DCSR were also related to thinking skills. Students wrote notes, thought carefully to determine how the notes could be linked, and put them in groups. They had to find out what their notes had in common in order to put them in groups:

P2: Here you write notes and you have to do group after.. so this implied you have first of all listening, listen to all the other ideas, and after you have to think how they are linked to each other. So you have to do this kind of work, link different ideas.

• It supported collaboration:

*P2: I think that this one, this method with the tabletop, there is more cooperation.* 

Student P2 viewed the DCSR as supporting extensive cooperation among students.

• It supports practising other language skills

DCSR was viewed as offering practice for multiple language skills such as listening, speaking, writing, and reading:

P4: Yes. For me, it's not only reading. If someone corrects all the notes after the class, it's like you are practising the writing.

P4: yes and after one paragraph if you write... in one paragraph, the first paragraph you read, and then you have to.. so you have to, sometimes you can use the vocabulary that you are understanding in this paragraph. It encourages use of new vocabulary in writing.

• Some parts of DCSR were viewed as more useful than others.

When students were asked about the most useful parts of the DCSR, they suggested the following: get the gist stage, wrap-up stage, click and clunk, and grouping. They also mentioned in the conversations below why they were the most useful ones.

#### Get the gist stage

*P1: The parts that is for reading 2 or 3 times. For example the first time you need to say or write the main important information that you read. And after you need to read again.* 

Me: which part is that? I mean, the most important, the most useful..

P1: but I don't know what is..

P4: the main ideas

P1: yes, when you need to write the main ideas of the text.

Me: the main ideas of the text. Like, give the gist you mean?

P2: Yes

### Wrap-up stage

P2: For me, when you do question and answer at the end, the last part.

Me: why do you think it is the most useful?

P2: because that part you have to have understood the text. So if you don't have an overall comprehension of the text, you will write questions which are not very good.

Me: but why do you think it is helpful?

*P2: because it make you focus on the text. Make you think about the text. Make you think about the main ideas.* 

#### Click and clunk

P3: For me Click and Clunk, because you can understand different words and you can organize all the text, because when you read for and don't understand any words, you are not able to understand the whole text. After Click and Clunk, you can.

#### Grouping

P2: I think that this one, this method with the Tabletop, there is more cooperation. I think that you have to make groups, you write notes and after make groups. Through making groups you can share your ideas, and also you can.

Figure 5.10 provides a summary of the positive aspects of DCSR highlighted by students.



Figure 5.10. Summary of positive views about the DCSR

#### 5.3.1.2 Negative views about DCSR

Students also also expressed some negative views about the reading programme.

• DCSR had no access to the internet

Students P2 and P3 hoped to have an internet connection while doing the tasks so that they could seek help from the internet through extra reading or watching a related YouTube clip:

*Me: are there any features you would like to see in the Tabletop computer that you did not see? And what are they?* 

P3: maybe internet connection.

• It does not allow connection to an external hard drive while working on the reading task

One disadvantage identified by student P4 was the inability to use the USB to save work. Although it was not possible for students to use a USB during data collection, the tabletop can save a recording of students' activities on the tabletop. Students, teachers, and parents can take a copy and view the student's performance and collaboration with others:

P4: like one note that is in the whole programme and it is just for you, and you can have a USB.

• No personal note throughout the task

Lack of a digital diary where students could reflect on their work while doing the task was one negative aspect identified in the interview:

P2: maybe a little space, where you can write some notes about if you have some doubts about grammar, other things you want to ask the teacher. Because when you are in class, sometimes you write notes about why they put the article here, why they use this tense, why they use the past perfect.. and after when the lesson finish you ask the teacher for this.. just a little space where you can write your own notes.

*P4: like one note that is in the whole programme and it is just for you, and you can have a USB.* 

• No assessment of students' performance at the end

There was criticism that there was no immediate assessment of their performance. The students wanted the system to tell them if what they did was correct or not:

P4: if someone then review my answers, or our speaking, I think I am going to learn more. Because, ok, I read, I brought my ideas, but nobody told me if I brought a good idea, so I don't know.

• The built-in dictionary had no phrasal verbs, idioms, or example sentences

When asked if there were any other features they would like to see in the reading programme, students mentioned that phrasal verbs, idioms, and example sentences would assist them to clarify meaning better:

P3: phrasal verbs and idioms
P1: yes
P4: yes
Me: ok, phrasal verbs and idioms. In what ways?
P2: this is very important
Me: in the dictionary?
P2: the dictionary yes because it doesn't have the phrasal verbs.

• Some fix-up strategies were skipped

Students didn't find the fix-up strategies coming before dictionary useful; they intended to skip them and jump to the digital dictionary:

P2: yeah, it was like we touched, we almost never like look the sentence again.
We almost went to the dictionary.
Me: you go immediately to the dictionary
P1: yes
P4: yes
Me: how many times did you do that?
P1: always
P4: always
P2: always, because that work, we have done before when reading.
Me: so you think it's not helpful?

• There was no timer

Student P3 highlighted the lack of a timer in the system, which could lead to inefficient use of time:

P3: I think the bad point of this is the thing that to do this properly is a clock.. just a time for to do every task. Because sometimes you stay, you become absent minded or think of other things because you have finished and other people are still working... maybe it's there a time to do every task.

Other students did not like the idea of adding a timer to the reading software:

P1: But I disagree with him because you have a clock, it's a more pressure

P2: You are under pressure

• No efficient use of waiting-time

Waiting time was viewed by P3 as being used inefficiently during the reading task.

P3: Whilst you are waiting, the vocabulary of the words you don't know the meaning, they can show maybe in different sentence to show the application of the word. Because sometimes we use the word in the incorrect way. So maybe this is a point, something to do, while you are waiting.

• The wrap-up stage was not helpful

The wrap-up stage was also viewed as unhelpful for several reasons: (1) it did not have clear conclusions about the reading topic; (2) it lacked organization and it was very messy; (3) the students did not feel like reading the content of the wrap-up stage because this had already been presented and discussed in previous stages; (4) the students preferred to write conclusions and summaries rather than questions and answers; and (5) the screen space during the wrap-up stage was occupied with the recorded previous stages.

• No clear conclusion in the wrap-up stage

P1: no because the final of the process, I don't see any part that shows all the groups, or the conclusion. You understand?
Me: yes, why do you think it's not helpful. Why is it the least helpful?
P1: no it's not helpful for me. Maybe we need one step more, the finally, to put the conclusion about all the group and say this is the brainstorming, you start here, and say a conclusion.

• The wrap-up stage is messy

*P3: yes but its very messy* 

P1: it's not organized, things here and questions there

P4: it's like a mess, for me

• Students did not read the content of the recorded previous stages:

P1: yes but we don't read the other things for example
Me: you don't usually read them?
P2: no, never
P1: no, for me, no
P4: no, I don't read nothing.
Me: you don't feel like reading them because..?
P1: no because you have all the text in your brain.

• Students preferred to write conclusions rather than questions and answers

P1: no it's not helpful for me. Maybe we need one step more, the finally, to put the conclusion about all the group and say this is the brainstorming, you start here, and say a conclusion.

*P2: maybe she wants close to her, when she does the last part, like a paper, a sheet, where there are all the work that you have done up the final section* 

P3: yes, I agree with that.

P2: so you can see the different group, the different ideas, and you can discuss

• The screen space during the wrap-up stage was occupied with the recorded previous stages:

P2: no, like this is your personal position here. I'm here, and this is where I write, and close to me is another page with all the thing we have done to summarize. Because we like, never had, we have never had, the stimulation. We never stimulate to open it, because attend this if one, to watch all, you have to open all but it takes a lot of space.

P3: yes but its very messy

Figure 5.11 below provides a summary of the negative views students expressed about the DCSR.



Figure 5.11. Negative views about DCSR

### 5.3.1.3 Order of fix-up strategies according to usefulness

Some interview questions asked about the most useful fix-up strategies. Students' preferences are presented below in order of perceived usefulness (Figure 5.12): first, the built-in dictionary;

second, looking for root, prefix, or suffix in the clunk word as clues to meaning; third, rereading the sentences before and after the clunk for clues to the meaning; fourth, rereading the sentence with the clunk for clues; and fifth, breaking the clunk into smaller parts (students skipped this strategy).



Figure 5.12. Order of fix-up strategies according to usefulness

# 5.3.2 Emerging themes related to individual and group discussion

When students were interviewed about their group discussion and text comprehension strategies, individual and group text comprehension strategies were identified.

# 5.3.2.1 Individual text comprehension strategies

• Asking people for help:

Me: how do you know that he doesn't know a word? How do you discover that a person doesn't know a specific word? P2: because he ask me.

• Reading the text again:

P3 (Carl): I read again, the paragraph, to try to understand something that maybe before I wasn't able to understand P4: the same of Carl

### 5.3.2.2 Group text comprehension strategies

• Helping peers by putting unknown words into simple sentences:

*P4: it's the same I think. What is the meaning of this word? And, the meaning or sentence. but with a simple sentence.* 

• Explaining meaning in L1:

*P3: just explain the meaning. Sometimes we did that because we use our own language to explain the word.* 

• Helping others by putting unknown words in a familiar context:

P2: yeah yeah, in this way, if he doesn't know the meaning of a word, I just use the same word in a different context, and a context maybe he already knows, in a context that is familiar for him. And use a sentence that maybe he already know, but using different words but they have the same meaning as a word he already know.

• Sharing ideas:

P2: I think that it is good because you share ideas, you listen other people's ideas, you try to find a link between ideas, and you can have an overall better comprehension.

• Listening to other peers' ideas:

P2: I think that it is good because you share ideas, you listen other people's ideas, you try to find a link between ideas, and you can have an overall better comprehension.

• Linking ideas:

P2: I think that it is good because you share ideas, you listen other people's ideas, you try to find a link between ideas, and you can have an overall better comprehension.



Figure 5.13. Individual and group text comprehension strategies

The views in the following extracts show that the participating students considered the advantages and disadvantages of the tabletop computer as a physical entity.

# 5.3.2.3 Advantages of the tabletop computer

The tabletop computer was perceived as having several advantages (Figure 5.14).

• Availability of touch screen:

*Me: what do you like best about the Tabletop computer? P1: touch screen* 

• Display of what other peers did on the tabletop surface:

P4: that you can see all

• The tabletop computer supports collaboration:

P2: I think that this one, this method with the Tabletop, there is more cooperation.

• The tabletop computer supports sitting close to one another: It is easy for students to ask for help:

P4: that you can see all

P2: I think that this one, this method with the Tabletop, there is more cooperation.

Students working on the tabletop are sitting next to one another and can see each other's work; and students who need help can find it easy to ask for help from their group as they are sharing the table.



Figure 5.14. Advantages of the tabletop computer as viewed by students

Only two disadvantages emerged.

• The tabletop computer was not high enough:

P2: I think it should be taller.
P1: yes
P3: yeah taller
Me: higher?
P4: higher
P2: higher yes, because very more comfortable

• There was no connection to the internet:

P3: maybe internet connection



Figure 5.15. Disadvantages of tabletop computer as viewed by students

5.3.2.5 Improvements suggested by students

Students made the several suggestions about improving the DCSR and making it more useful.

• Adding sentence examples to the built-in dictionary

P1: for me it is enter the dictionary. When you do the Click and Clunk. The final step is the dictionary about what is the meaning of this verb. But I think that have another step that appear, this verb but in another sentence.

P2: another context, yes, I thought the same thing

Students suggested having examples showing the meaning in the same context as that of the reading passage:

P1: examples.Me: gives you examples. You need to see examples?P4: yes but of a whole sentence. A new sentence with this new vocabulary.

*P2: there is "pull off", it gives you again the sentence with pull off, the text should be better if there is also pull off in another sentences, that make you understand it.* 

• Adding phrasal verbs and idioms to the dictionary

P3: phrasal verbs and idioms
P1: yes
P4: yes
Me: ok, phrasal verbs and idioms. In what ways?
P2: this is very important
Me: in the dictionary?
P2: the dictionary yes because it doesn't have the phrasal verbs.

• Simplifying the wrap-up stage

Students suggested simplifying the wrap-up stage as they thought it was complicated or not helpful:

P4: for me, finally, have to be like, one note that you have to write about all conclusion of all the group. And then you are discussing all the notes that you wrote, you are discussing with another person a way to discuss with other groups. Do like a final..

• Making the text ready for underlining and highlighting

Underlining is a technique participants commonly used for paper-based reading comprehension tasks, and this technique was not possible in DCSR. For future design improvements, this feature should be added so that students are able to digitally underline or highlight text:

P2: I usually underline the words that I don't know in order to look for them afterwards in the dictionary or ask to the teacher. And I, it's like this, I read to, up the dot, I read up the dot, until the end of the text. To check if I understood. Like, you say until the dot, no? when there is like a paragraph?

• Adding a timer:

P3: just a time for to do every task. Because sometimes you stay, you become absent minded or think of other things because you have finished and other people are still working.. maybe it's there a time to do every task.

P3: Because if you have like a clock, you are forced to work, you are more involved.

• Making use of waiting time:

P3: Whilst you are waiting, the vocabulary of the words you don't know the meaning, they can show maybe in different sentence to show the application of the word. Because sometimes we use the word in the incorrect way. So maybe this is a point, something to do, while you are waiting for..



Figure 5.16. Improvements suggested by students

#### 5.4 Chapter summary

In this chapter, two types of analysis were carried out; analysis of students' collaborative reading interactions on the tabletop computer, and analysis of students' opinions expressed in the interview. Analysis of the video recording of students' face-to-face collaboration and the activities on the tabletop computer surface (see, for instance, extract S1), documented how students practised scaffolding one another while collaborating face-to-face or via the tabletop computer. Analysis revealed four types of scaffolding tool: verbal strategies, non-verbal strategies, joint verbal and non-verbal strategies, and system tools.

**Verbal strategies** consisted of speaking and reading (see section 5.2.2 for detail). Speaking was observed to consist of a number of strategies such as explanation, elaboration, procedural instruction, comprehension check, and response to clunks—verbal response (definitions, explanation of meaning, offering antonyms, offering synonyms, spelling, feedback, and help with morphological form). Reading included two related scaffolding strategies: reading peers' notes aloud, and reading one's own notes. Each of these verbal strategies had evidence in the data as having scaffolding functions in alignment with the literature on scaffolding (see Figures 5.2 and 5.3).

**Joint verbal and non-verbal strategies** category was observed to have one scaffolding strategy (pointing and commenting) which took two forms: clarification of instructions, and help with grouping. These two behaviours were noted as scaffolds involving speaking and hand

gestures (see Figures 5.4 and Figure 5.5 for their scaffolding functions). Pointing without commenting was a **non-verbal scaffolding** strategy observed in the video data (see Figures 5.6 and 5.7).

**System/technical** tools were also revealed in the data (Figure 5.8), including response to clunks (fix-up strategies and next strategy), new note, digital note, grouping, text area, unknown word, unknown words in private space, unknown words in public space, and instructions. System tools were further observed to have their own scaffolding functions, as illustrated in Figure 5.9.

This chapter concluded with analysis of the findings of students' interviews to further establish a clear understanding of the notion of scaffolding in this technological environment by collating their perspectives with the findings observed in their interaction data.

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# **CHAPTER 6: DISCUSSION**

#### **Chapter 6: Discussion**

#### 6.1 Introduction

This chapter is devoted to the discussion of findings presented in the previous chapter. This study has aimed at investigating the scaffolding user strategies and the scaffolding system tools and their functions in a tabletop-assisted collaborative reading platform and finding out students' views about such a platform. The thesis argues that the tabletop assisted language learning environment, as a whole learning environment, can offer scaffolding for students' reading comprehension. This chapter provides an overview of the study and a discussion of the main research concepts and findings. It attempts to summarise the data which provided answers to the research questions. This summary is structured around the research questions but it is organised in themes. Within such themes, (i.e. designing for scaffolding, instructions as scaffolding tools, activating background knowledge and making predictions, and constructing meaning from multiple resources), answers to the research questions are discussed. This approach is opted, instead of the widely used organisation of the discussion chapter (i.e. discussion of the findings of each research question separately), to provide a wider explanation of aspects of the main research concepts and findings. I found this approach to be more flexible for the organisation of this thesis. It also allowed me to discuss answers across the three questions more conveniently.

#### 6.2 Overview of the study

The study was built on a sociocultural theoretical and a microgenetic analysis framework. The aims were to explore the possibility of designing an application that could run on a tabletop computer and scaffold students' reading comprehension, and to understand how the designed application could scaffold students' reading comprehension on the tabletop computer. The study aimed to answer the following thesis question and its sub questions:

#### **Thesis question:**

How can tabletop computers scaffold ESL reading comprehension?

#### **Research Questions:**

1. How can an application be designed to scaffold students' reading comprehension on the tabletop computer?

2. What are the user strategies and the system tools that could scaffold students' reading comprehension on the tabletop computer, and what are the functions of these strategies and tools?

3. What are the students' experiences when reading on the tabletop computer?

To answer these questions and attain the research objectives, this study undertook a single-case study. It investigated a group of four ESL students reading collaboratively on the tabletop computer. Audio and video recordings of the students working on the tabletop computer were collected, and their activities and discussions while using the DCSR application on the tabletop computer was also recorded via video screen-capture software. A face-to-face interview with all four students was conducted to investigate their experiences regarding reading on the tabletop. Interview data were analysed to gain insights into this emerging technology with regard to scaffolding reading.

#### 6.3 Discussion of main research concepts and findings

#### 6.3.1 Designing for scaffolding

The first research question guided the design of the DCSR application, which acted as the learning platform together with the physical digital tabletop computer. It also acted as a data collection method for the second research question, as it made it possible to know how scaffolding (for reading comprehension) could take place on this technology. The first research question was answered in Chapter 4, which gave a detailed explanation of how a digital collaborative reading application came into existence. The design features were made compatible with the tabletop computer to allow collaboration and interaction with and through technology. The aim was to identify whether the tabletop computer could offer scaffolding for reading comprehension, and, if so, how the scaffolding tools could be designed and integrated in order to support collaborative reading comprehension.

This investigation was carried out in the absence of a pre-existing design framework for scaffolding reading comprehension on the tabletop computer. Reading up on the relevant literature and consultation with experts in language learning and human–computer interaction led to the design of a programme/application that combined the strengths of traditional table collaboration, digital tabletop collaboration, and effective reading instruction. The design took
account of guidelines and insights from the literature (Dillenbourg & Evans, 2011; Kharrufa, 2010; Scott et al., 2003).

Answering the first research question led to the DCSR and its components as the "final product". The DCSR design is informed by managerial tools: "add group", the "group" tool (Figures 4.22 and 4.23), "trash" (Figure 4.21), "private list of unknown words" (Figure 4.27), "list of all unknown words" (public space) (Figure 4.30), "list of all unknown words" (private space) (Figure 4.29), "list of solved words" (public space) (Figure 4.30), and "unknown word" (Figure 4.31). These software tools as well as the various DCSR stages, which are based on the CSR teaching approach, together provide a learning platform or construction (i.e., DCSR). This platform was proposed to provide scaffolding not only through the software tools but through peers' behaviour and any materials in the tabletop-based environment. The main functions of the managerial tools in the DCSR are to structure and organize the physical learning environment (Walsh, 2011) and facilitate problem solving (Lidz, 1991).

The second finding from the first research question was "material tools". One of the pedagogical goals of the "materials mode" is "to elicit responses in relation to the material" (Walsh, 2011, p. 113). For example, a material tool will elicit responses in relation to the reading text. Both managerial and material tools primarily aimed to provide a social context for interaction with expert peers and the system tools, and lead from there to individual language development, then on to strategic processes (Donato, 1994) of reading comprehension. Managerial and material tools formed the structure of the DCSR.

Integrating the CSR teaching approach into a digital platform shaped the process of strategic reading comprehension throughout the task. The whole digital reading platform provided students with embedded tools. It also allowed, through promoting peer interaction, for the existence of other verbal and non-verbal scaffolding strategies, which emerged in answer to the second research question of the study. The extension of strategic reading tools from the paper-based CSR approach to the DCSR application is one of the major contributions of this research. Modifications to the CSR were carried out to suit the nature of the tabletop computer. Strategic reading tools took over the responsibility for structuring and organizing the task from the teacher as no demonstration and modelling are required. However, students took responsibility for activating and monitoring parts of the task.

### 6.3.2 Instructions

The DCSR stages contained strategic instructions to guide students through the four stages: (1) preview (brainstorming and prediction to activate prior knowledge and to allow predictions before reading), (2) click and clunk (to monitor reading comprehension and vocabulary development during reading), (3) get the gist (to get the main ideas of a paragraph or section during reading), and (4) wrap-up (to make a summary of key ideas after reading). Instructions "describe how to carry out the task by describing and explaining each step" (Eiriksdottir & Catrambone, 2011, p. 750). Examples for instructions followed this pattern:

- a. Brainstorming—Write what you already know about the topic.
- b. Create one idea per note.



Figure 6.1. Example of instructions

Instructions on the tabletop had three specific scaffolding functions according to analysis of the students' interaction. These scaffolding functions were direction maintenance, recruitment, and intentionality. Direction maintenance and recruitment are part of Wood et al.'s (1976) scaffolding functions, while intentionality is one of Lidz's (1991). System instructions were to maintain direction, keeping students on track to achieve the task goals and construct knowledge. Some of these instructions served to introduce the activity and draw students' attention to the pedagogical focus of the task (Walsh, 2006) as in, for instance, "Brainstorming-write what you already know about the topic". This instruction introduced the brainstorming part of the activity to students and required them to focus on writing only about the given topic, and only about what they already knew. Giving instructions took the form of *directing* (Anton, 1999) rather than telling (Langer & Applebee, 1986): instructions in the DCSR direct students to take certain actions in order to complete the task. In Tharp and Gallimore (1988), instructing is described as assigning tasks; and instructions also have a recruiting function (Wood et al., 1976) because they invite students to do or to perform an action to achieve a task goal. For instance, "Write what you already know about the topic" invited students to write down relevant background information.

The system instructions were general and used to initiate certain actions such as brainstorming or predicting ideas about the reading topic. However, instances (in extract S4, line 1, for example, "any ideas about the competitive the competitive in sport, someone think that sport is very competitive") showed some evidence of scaffolding peers by directing them to share their digital notes in order to identify any similarities or differences in their input. In extract S4, line 1, there is an instruction embedded in the form of an invitation: in this instance, students were recruited to share their ideas and thus assist their performance in their zone of proximal development (ZPD). Specifically, there was evidence of development towards the potential level of ZPD in lines 6 and 7 determined through discussion about grouping the notes already made by peers. This ZPD area finished once the students were able to construct groups of ideas that were similar or that shared one theme. Peer scaffolding and system scaffolding were completed by touching the "done" tool to permit another stage to start.

# 6.3.3 Activating background knowledge and making predictions

Background knowledge activation started in the preview stage where students briefly and quickly read the entire passage. In this brainstorming stage, students brought their prior information about the topic to the task. This is a top-down reading process, moving in only one direction (Grabe, 2009). Managerial tools, such as instructions, scaffolded students' progress and kept them in pursuit of the task objective (Wood et al., 1976). Interestingly, fading, as a key element of scaffolding, did not seem to be optional for single students: the whole group tended to decide when no further scaffolding was needed: that is, when all the students understood the requirements of the brainstorming stage they take the next step, touching the "new note" tool in order to start writing notes about their previous knowledge on the topic. This fading is similar to that in Model-It (Jackson et al., 1998), where scaffolding is student-initiated and is faded with "stop reminding me" buttons. In DCSR, scaffolding from instructions is faded individually because not all students start writing notes at the same time. Another managerial tool is the "done" tool by which system scaffolding and peer scaffolding are faded to allow transition to the next stage.

The "new note" tool is a managerial tool used to create a digital note (a material tool). It aims at promoting reflection on parts of the reading task by providing a digital note on which to input text. Jackson et al. (1998) provided similar prompts named reflective scaffolding tools; these provided notepad windows for students to input text. The DCSR digital note also agrees in

function with Fretz et al.'s (2002) "articulation text box scaffold which prompts learners to articulate explanations and descriptions (of objects, variables, and relationships)" (p. 571).

Material tools in the brainstorming stage were "digital note", "add group", and "group". The ZPD of each student started when they read instructions about how to perform the brainstorming stage, create new notes, input text, and put similar notes into groups. Findings revealed that the strategy of putting digital notes into groups was effective in scaffolding collaboration; it appeared to promote collaboration and push the discussion towards achieving the goal of the reading task in general and the brainstorming task in particular. This was clearly seen in all the extracts (see Chapter 5) that involved verbal scaffolding strategies—where language was the main strategy for mediating collaboration and pushing discussion forward. Discussion about the digital notes involved explanation, elaboration, procedural instructions, spelling, translation, reading peers' digital notes, and reading one's own notes.

The "new note" and "digital note" tools aimed to elicit responses from students during interaction with the reading text on the tabletop computer surface. These responses were writing ideas onto notes and grouping similar responses; their scaffolding functions were direction maintenance and recruiting. The two extracts below, taken from the interviews with the students, show how the use of digital notes on the tabletop computer was viewed as involving sharing their ideas via the digital notes and linking ideas in groups. This required employment of critical thinking and discussion.

Here you write notes and you have to do group after. so this implied you have first of all listening, listen to all the other ideas, and after you have to think how they are linked to each other. So you have to do this kind of work, link different ideas.

First of all, when you write notes, you think, and also as, when you make groups, it is good because you have to listen and see other ideas, and also you have to find the link that there is between different ideas.

Digital notes encouraged the making of groups or putting shared ideas into groups. The grouping stage was made easy because of the inclusion and saving of all ideas in digital form, as these students' explain:

Yes. And also you can hear how the same idea that you brought before, someone explain but in another, a different way. And you can get expression that you think is useful, or better than yours, note.

### The grouping is ok because you hear, you see what the others note or sentences

Creating digital notes was also viewed as supporting the practice of language skills such as writing, because making the notes usually involved summarization skills:

In one text, you can use listening a little bit because you are speaking with your classmates... You are writing, if someone then corrected the notes that you wrote, it is like you are practising the writing; the speaking if your teacher is listening you; and also reading, and comprehension of the text.

During the prediction stage, the same system scaffolding tools were involved (i.e. "new note", "create one idea per note", "digital note", "add group", and "group") because these were embedded in the system and were static. However, peer scaffolding will not always be the same because it is contingent/dynamic and adapts according to peers' needs. Students on the tabletop computer scaffolded their peers' behaviour recognised by Langer and Applebee (1986) as peer assistance and later developed by Donato (1994) and renamed collective scaffolding. They scaffolded one another using different verbal and non-verbal strategies (see Figures 5.2, 5.4, and 5.6). According to sociocultural theory these are cognitive strategies by which students mediate their understanding through social processes that allow them to appropriate such scaffolding strategies as their own. This view has been validated in studies such as those of Donato (2000) and Ohta (2000). For verbal scaffolding strategies (speaking and reading), language was the symbolic strategy for mediating language learning and reading comprehension on the tabletop. Other non-verbal strategies, used as symbolic ones by students, were pointing and commenting, pointing without commenting, and the system tool. At the end of each stage, new knowledge was constructed and internalized through various symbolic strategies and tools and through interactional strategies (Walsh, 2012) that afforded opportunities for language learning.

# 6.3.4 Construction of meaning from multiple resources

A microgenetic analysis of students' face-to-face interactions, as well as their interactions with and through the tabletop computer revealed the scaffolding strategies and tools employed by students during their collaborative reading. The scaffolding functions of such strategies and tools were revealed as well. Following the microgenetic analysis, instances of scaffolding strategies and tools were identified through direct observation of the data. "A microgenetic analysis allows us to observe directly how students help each other during the overt planning of L2 utterances and the outcome of these multiple forces of help as they come into contact, and interact, with each other" (Donato 1994, p. 42). Because of the adoption of a sociocultural perspective in this study, language learning was considered a developmental process mediated by the scaffolding user strategies and the scaffolding system tools as semiotic resources available in the tabletop computer environment (Donato, 2000; Lantolf, 2000; Lantolf and Thorne, 2006).

The data analysis presented in Chapter 5 showed that scaffolding from system tools did not occur in isolation from other verbal and non-verbal scaffolding strategies. According to Ohta (2000) and Donato (2000), the social process of mediation allows for language, as a verbal scaffolding strategy, to become a cognitive tool for language learning. Similarly, non-verbal strategies and system tools may be viewed as cognitive tools/strategies due to the links and interrelations they construct between the interpsychological and intrapsychological planes (Ohta, 2000).

The main system tool in the construction of meaning was "text area", which aimed to elicit responses from students during interaction with the reading text that appeared on the tabletop computer screen in the private space of each student. These responses were limited to reading for understanding of ideas and for the meaning of unknown words or unclear ideas. The text area tool scaffolded students' reading comprehension by maintaining direction, keeping them in pursuit of the task goals. The text area was displayed for the students to keep them focused on the reading task while showing them the clunk (unknown word) which the system was processing. The text area in this case was part of the social context that contributed to the students' construction of meaning. This tool gave students multiple access to the reading text, to allow individual interaction with it.

The extracts below refer to the "click and clunk" stage, where students were given access to the reading text in order to tell the system which vocabulary they had problems with. The system gave students one paragraph or section at a time rather than the whole text at once, to enhance focus and facilitate understanding. In the following extract, students were asked about the parts of the digital reading task they found useful. Some viewed the click and clunk stage as one the most useful ones and explained why they thought so: it allowed each student to read at an individual pace while having access to that section or paragraph of the reading text (see Figures 4.25 and 4.26).

*P3* : *I* read again, the paragraph, to try to understand something that maybe before I wasn't able to understand

P4: the same of Carl

*P3:* For me Click and Clunk, because you can understand different words and you can organize all the text, because when you read for and don't understand any words, you are not able to understand the whole text.

After activating the background knowledge, making inferences and predicting, all important top-down strategies for reading comprehension, students were prompted by instructions in the click and clunk stage to complete their strategic reading by performing bottom-up strategies and reading to monitor understanding and vocabulary knowledge as part of their reading strategy. Some students with limited lexical knowledge had difficulty understanding the meaning of some words, and as "guessing will not overcome this deficiency and lead to automatic recognition" (Alderson, 2000), a technological and social dimension of scaffolding was necessary to fit side by side with the interactive reading. In extract S7 there is evidence of peer scaffolding in lines 18 and 20 of the student's (Lada's) recognition and uptake of her peers' (Carl and Dim) attempts at scaffolding in lines 7–17. System scaffolding tools (fix-up strategies) were embedded in the DCSR as part of the strategic reading offered by the DCSR for students.

Students were able to mark unknown words during reading. Other system tools offered by the DCSR system during the click and clunk stage were "instructions", the "unknown word" tool, and the "list of public unknown words in private space". These functioned as recruitment scaffolding tools, while the last two also functioned as tools for marking critical features (see Figure 4.31) that were essential for the completion of the task, and therefore were marked for students in different ways in order to draw their attention to them (i.e., words that students had marked as unknown and that the system had identified and shown on the tabletop surface). In extract S7, for instance, these system tools were associated with the spoken language tool "comprehension check", which was used to assess peers' understanding of vocabulary and also operated during the reading comprehension. The system showed unknown words one at a time.

One of the requirements of the reading task was to overcome any lexical gaps by recruiting students' interest to try the fix-up strategies (Figures 4.32–4.36). Students used the "next strategy" (recruitment) tool to move from one fix-up strategy to another, looking for possible solutions to vocabulary problems. Interestingly, in most cases, as reported in their interviews, students tended to skip the first four strategies and rush to the built-in dictionary, the fifth

strategy<sup>2</sup> (Figure 4.36). According to the extract below, the students always went straight to the dictionary. The fix-up strategies had been designed in a way that allowed students to move forward from one strategy to another. Students in many occasions skipped some fix-up strategies and proceeded to the last one the dictionary. This skipping process happened in seconds as students touched the "next strategy" tool to quickly recall, for instance, the second fix-up strategy, then the third one, and so on, without paying any attention to the content of these strategies, until they reach the built-in dictionary

*P2: yeah, it was like we touched, we almost never like look the sentence again. We almost went to the dictionary.* 

*Me: you go immediately to the dictionary P1: yes* 

The dictionary offered easy, quick access to the definitions of words. One reason reported for such skipping was that they thought they had done the work earlier while reading ("*because that work, we have done before when reading*" (*P2*)). This was interpreted by referring to the part of the interview preceding the comment, above. In the extract below, P1 considered the dictionary definition helpful. P4, P2, and P3 considered the first three strategies (displaying the sentence with the unknown word (Figure 4.32), displaying the sentences before and after the one with the unknown word (Figure 4.33), and displaying a sample of a word broken into prefixes, suffixes, and roots in order to remind them to look for such parts in the unknown word in hand (Figure 4.34)) as extra information, while P1 considered them unnecessary.

Me: because these are 5 strategies, how helpful do you think they are? P1: the last one, definition P4: for me, the first 3 strategies you do when you are reading P2: yeah P3: yeah Me: what about other things? P1: for me, it's not necessary

The students' tendency to go immediately to the built-in dictionary was exemplified in their interaction. For instance, in Extract S7, Lada did not know the meaning of the word "courageous", and her peers provided scaffolding to her ZPD until she reached actual

 $<sup>^{2}</sup>$  The DCSR has five fix-up strategies (Figures 4.32–4.36); the last one is the digital built-in dictionary.

development in lines 18 and 20 without using any fix-up strategies. Line 20 was followed by turns (see the extract below) where there was some evidence of students skipping the fix-up strategies:

### Extract D1

P1: after I have told you ten thousand stories about ghosts
P3: you are not afraid... but something is to face up difficult situations in your life
P1: yeah, yeah
P4: but it's the same in Spanish I think
P1: yes, in Italian it is the same... corage
P4: yes
P3: yeah it's the same
P1: let's try next strategy done
P3: done
P2: ah done
P2: us [done]
P4: [done]
P3: desire

More clarification continued for the meaning of the word courageous (extract D1, lines 1–7). In lines 8–12 in extract D1, P1 invited the rest of the group to touch "next strategy" to get rid of all the fix-up strategies and move to the next word ("desire", line 13). Fix-up strategies provided students with adaptable and optional fading. In many cases during interaction, verbal scaffolding when students encountered lexical gaps was favoured more than system scaffolding via fix-up strategies; but this was not always the case: in extract FUS, the word "bystanders" was problematic for all students and all five fix-up strategies were used. The scaffolding functions of all the fix-up strategies offered meaning, frustration control, demonstration, and marking critical features. Another example from the interviews adds further validation to the preferences for the built-in dictionary over the other strategies on offer: the students were asked to order the most useful fix-up strategies according to their experience. The order was as follows:

- First: the built-in dictionary
- Second: looking for root, prefix, or suffix in the clunk word as clues for meaning
- Third: rereading the sentences before and after the clunk for clues to understand the meaning
- Fourth: rereading the sentence with the clunk for clues
- Fifth: breaking the clunk into smaller parts. Students skipped this strategy.

Once students had no more vocabulary problems they moved to the get the gist stage, where they constructed the main idea of the each paragraph in the reading text.

# 6.3.4.1 Evolution of the notion of scaffolding

This section provides a discussion of the changes that occurred in the notion of scaffolding with regard to its key elements (i.e., shared understanding, the scaffolder, ongoing diagnosis and fading) (Puntambekar & Hübscher, 2005) during this study. These are important for the construction of meaning, because the amount and structure of scaffolding resources went through several changes, and at each stage the notion of scaffolding evolved (see section 2.2.2). In the traditional notion of scaffolding, construction of meaning mainly depends on the expert, the teacher or the most knowledgeable peer (Puntambekar & Hübscher, 2005). This concept has evolved and developed to include scaffolding from software tools or technological tools.

The three major supports provided by the system tools available in the DCSR are providing structure for the task, providing tools for scaffolding students' reading comprehension, and supporting the teacher's management of the classroom. The last support was not addressed in this study, but is worth further investigation in future research.

Features of scaffolding	Original Notion of Scaffolding	Puntambekar and Hübscher's (2005) Evolved Notion of Scaffolding	Tabletop-based Evolved Notion of Scaffolding
Shared understanding	Adult or expert establishes shared understanding of common goal and provides motivation	Authentic task often embedded in the environment; provides a shared understanding	Authentic task embedded and peers share understanding and provide motivation
Scaffolder Single knowle provid comple Multir provid individ	Single, more knowledgeable person provides support to complete the task	Assistance is provided; tools and resources	Assistance is provided by system tools, user strategies, or both
		Distributed expertise— support is not necessarily provided by the more knowledgeable person, but by peers as well	
	Multimodal assistance provided by a single individual		
Ongoing diagnosis and calibrated support	Dynamic scaffolding based on an ongoing assessment of the learner (individual)	Passive support—ongoing diagnosis by peers and or software is not necessarily undertaken	Dynamic and passive scaffolding
			Adaptive and blanket scaffolding
	Adaptive scaffolding— support is calibrated and sensitive to the changing needs of the learner	Blanket "scaffolding"— support (especially in tools) is the same for all students	Has potential for teacher diagnosis
Fading	Eventual fading of scaffolding as students become capable of independent activity	In most cases, support is permanent and unchanging	Gradual fading of peer scaffolding
			Immediate fading of system scaffolding

Table 6.1. Tabletop-based evolution of the notion of scaffolding

Source: Puntambekar and Hübscher, 2005, p. 7. A more recent study on scaffolding, a synchronous online professional development course, has also replicated this table (Hennessy, 2012, p. 5).

Following Puntambekar and Hübscher (2005, p. 7), who created a table to differentiate between two notions of scaffolding (the original and the evolved notions of scaffolding, up to its use at the time of their study); a table demonstrating the evolved tabletop-based notion of scaffolding since that time would be useful.

Table 6.1 replicates the table of Puntambekar and Hübscher (2005) and adds a third category, the evolution of the notion of scaffolding in the tabletop-assisted language learning environment; the table illustrates how the notion of scaffolding has evolved from its original one to this most recent construct. In the tabletop-based construct, shared understanding is achieved through peers' sharing of task goals and authentic embedded tasks. In the DCSR, shared understanding was achieved through strategically designed reading stages with clearly stated instructions at the start of each stage. The concept of a scaffolder was extended to include (1) peers using

verbal scaffolds, non-verbal (gesture) scaffolds, and system scaffolds (e.g. making decisions about using specific system tools), (2) system tools; for example, a display of instructions or fix-up strategies, and (3) a combination of verbal and non-verbal strategies.

Ongoing diagnosis, a significant feature of the tabletop-based evolved notion, is associated with dynamic, or active, scaffolding. Peer diagnosis was observed in many instances of student interaction during this study. The DCSR system allowed peer diagnosis then dynamic scaffolding when students were involved in interaction (see for example, extracts S17 and S18). The DCSR also has a potential for teacher diagnosis, if a teacher is involved. There are also passive scaffolding tools that do not offer ongoing diagnosis; for example, managerial and material tools are static, passive scaffolding tools that do not afford ongoing diagnosis by themselves, but provide a structure for peer scaffolding.

Scaffolding is always adaptive (contingent) in the case of peer scaffolding, and in certain cases of the system tools. In peer scaffolding strategies, students provide assistance to each other calibrated to the current need. The system tools are adaptive if they are peer-controllable, but become blanket scaffolding tools if they are not; for example, fix-up strategies were observed to have both characteristics (see 6.3.4 for discussion about fix-up strategies).

Peer scaffolding fades gradually, but in system scaffolding the fading is immediate. An example of immediate fading in the system tools is the uses of the "done" tool. When students want to stop scaffolding, they agree as a group to move to the next stage and touch "done". This halts any peer scaffolding or system scaffolding taking place (see section 6.3.3 about 'fading').

# 6.3.5 General discussion

It is evident from the explanations above that the learners who took part in this study were actively engaged in it, and contributed to the construction of discourse in the tabletop-based environment. During their interaction with the tabletop computer, discourse was not limited to spoken and written discourse but included non-verbal discourse such as gestures as well as tabletop artefacts such as digital notes. The DCSR was the incubator and the construction; however, for effective implementation of the pedagogical goals of the design, it was important for me as both researcher and designer to understand the interactional organization of the tabletop computer environment. Although in my position as teacher I tried to respond to recommendations in the literature to understand the interactional organization of the learning

environment (Glew, 1998; Johnson, 1995; Seedhouse, 1997), I found that so far available practice and research (Almutairi, 2014; Seedhouse & Almutairi, 2009) has been carried out to reveal the dynamics of interaction and of interactional organization in a tabletop computer environment. Although the task used in Seedhouse and Almutairi's study to generate interaction was based on jumbled sentences and so was not a reading comprehension task, their work offered useful insights to the current study with regard to information gained from interaction (i.e. face-to-face interactions combined with the use of tabletop artefacts).

The DCSR is considered in this study as a theoretical construction, investigated by way of the research questions to identify scaffolding strategies, tools and their functions. Analysis of data produced from such investigations considers the perspectives of sociocultural theory, that learning involves social interaction (Lave & Wenger, 1991; Vygotsky, 1978).

### 6.4 Chapter summary

This chapter presented the discussion of findings from in the previous chapter. It also provided an overview of the study and a discussion of the main research concepts. Answers to the research questions were discussed with regard to the following themes, (i.e. designing for scaffolding, instructions as scaffolding tools, activating background knowledge and making predictions, and constructing meaning from multiple resources.

# INVESTIGATING SCAFFOLDING DURING COLLABORATIVE READING ON THE TABLETOP COMPUTER

# **CHAPTER 7: CONCLUSION**

# **Chapter 7: Conclusion**

### 7.1 Introduction

This chapter briefly summarizes the study and presents the key findings. It also presents limitations of the study. Implications and contributions of the study are then overviewed. The chapter concludes with recommendations for future research.

# 7.2 Summary of the study

This section attempts to give the reader an overview of the whole thesis. The study aimed to explore the potential of the tabletop computer to support language learning in general and reading comprehension in particular, and to further understanding of how the capabilities/affordances of this technology might help in scaffolding reading comprehension. Such exploration was undertaken via answering the research questions.

It was not possible to carry out this study without designing an application which can run on the tabletop computer and scaffold students' reading comprehension. The digital collaborative strategic reading (DCSR) application was the main significant outcome of the study in general and of the first research question in particular (see Chapter 4). Without DCSR, it would not have been possible to answer the second research question which aimed to explore the strategies and tools that could scaffold students' reading comprehension and the scaffolding functions of these strategies and tools.

In addition to the scaffolding strategies (verbal and non-verbal) and their functions that emerged from data analysis, the study contributed to extending the concept of scaffolding from one-toone tutoring (Wood et al., 1976), self-scaffolding or metacognitive scaffolding (Holton & Clarke, 2006), collaborative learning (Rojas-Drummond & Mercer, 2003), and computerassisted collaborative language learning (Beatty, 2003), to a co-located and a computer-assisted collaborative language learning (i.e. the tabletop computer). Data analysis of several extracts from the data revealed students' development within their zones of proximal development while deployment of scaffolding strategies and tools. Some are verbal strategies as in Wood et al. (1976), others are technological tools as in Bell and Davis (2000), Toth et al. (2002), and Jackson et al. (1994) whose designers argued that such tools have the capability to help learners overcome difficult tasks by providing a supportive structure. Similar to Brush and Saye (2002), this current study differentiated between two levels of scaffolding: hard (embedded) scaffolds and soft (contingent) scaffolds. Embedded are any scaffolds planned in advance and integrated into the design of the task, and soft or contingent scaffolds are adaptable during students' interactions.

Findings proved the research argument to be true. The thesis argued that the tabletop assisted language learning environment, as a whole learning environment, can offer scaffolding for students' reading comprehension. Findings, with regard to technological tools, meet researchers' argument that such tools have a supportive structure (Bell and Davis, 2000; Jackson et al., 1994; Toth et al., 2002).

Although there was no quantification of qualitative data, there were interesting observations with regard to four scaffolding strategies: speaking, reading, digital notes, and grouping. It was evident from the data that they were the main source of encouraging interaction and collaboration among students. Most of the vocabulary problems were solved through speaking with peers or receiving spoken assistance from peers (see for instance, extracts S1, S3, S7). Both speaking and reading aloud shared externalisation of students' thinking and made their ideas exposed to their peers (see extracts S1, S3, S4). This made it easy for peers to pinpoint what other students know and do not know (Pressley et al., 1996). Digital notes and grouping caused a great deal of externalisation of students' thinking. Externalisation of thinking through grouping has already been confirmed by work of Kharrufa (2010).

Further interesting findings emerged from students' group interviews. According to their own practice and experience with the digital system, students expressed their views towards the reading programme, the group discussion and collaboration, and the tabletop computer in response to interview questions (Appendix 8). Each one of the three 'predefined' themes has its own sub-themes that emerged from the interview analysis; the reading programme has three themes: both positive views about DCSR, negative views about DCSR, and a summary of the order of fix-up strategies according to usefulness. The group discussion theme has two themes: individual text comprehension strategies and group text comprehension strategies. The tabletop computer. A fourth group of themes, which is an emerged theme, involved suggestions for improving the reading programme (DCSR).

#### 7.3 Limitations of the study

Although much effort has been exerted to collect data from various resources in order to undertake a suitable form of investigation to achieve the research aims, it is important to be cautious about the findings as they can only be generalizable to similar contexts. What limits the generalizability of findings is the small-scale research design of the study. Sections 3.6 and 3.7 indicated that the sample size is relatively small. Therefore, the idea of conducting a quantitative side of the study was abandoned because the samples may not be representative of the ESL population, and they may yield insignificant statistical results. In an alignment with a general trend in research on CALL, I found it wiser to shift to a qualitative study where the focus was on the process rather than on the product. This approach aligned well with the general trend in research on CALL, which has become "less quantitative and more qualitative" (Kern, 2006, p. 202). However, given the nature of research questions, which obliges focus on the 'process', and the small number of participants, the interpretation of results should be limited to the group of four students examined. Another pitfall is that small-scale research is "less likely to be taken seriously by other academic researchers or by practitioners and policy makers" (Griffin, 2003, p. 10). Simpson and Tuson (1997) suggested to adjust the nature and scope of the claims in case the sample size is small. For instance, the following claim is less likely to be appropriate for the current study: 'My research shows the scaffolding strategies and scaffolding system tools employed by ESL students for reading comprehension on the tabletop computer'. A more appropriate claim should be more specific and clearly state that employment of strategies and tools is done by a 'group of four ESL students'. Therefore, in answer to research questions, taxonomies of scaffolding strategies, system tools, and scaffolding functions, and interview themes are limited to this current small-scale study and to very similar studies.

It was also unfortunate (and limiting) that the interview questions did not cover all aspects of the DCSR. Questionnaires and stimulated recall interviews might have covered more points and provided more details about the students' views, had there been time to conduct these. The limitations of the interview questions were partly because detailed knowledge of the DCSR application could not be covered in more detail in the interviews, which the interview question could not cover in more detail, and also because there was limited time available for the interviews, which necessarily focused on those topics the students were best able to address.

# 7.4 Contribution and implications of the study

This study has implications which are relevant to both the theory and practice of language pedagogy. Through inductive investigation of scaffolding in a tabletop-assisted languagelearning environment, this study contributes to sociocultural theory as it identified scaffolding strategies, tools and functions in this particular context of students engaging with the tabletop computer. Prior to the investigation of students' interactions, the study produced a working language learning platform for reading comprehension on the tabletop computer; this innovation (DCSR) paved the way for examining theoretical implications and identification of the sociocultural context of assisted performance. DCSR also contributed to the recognition that mediation of human cognition is not limited to strategies, tools and signs only, and notably language, but can be any source of assistance provided in the social and cultural context. DCSR was used in the present study as a language learning platform, as a data collection instrument because of its ability to record interaction on the tabletop computer surface, and as a research tool to investigate scaffolding. This innovation may prove fruitful for (1) teachers in schools or universities, due its flexibility in offering reading passages according to students' level of ability; (2) for researchers to further investigate or evaluate; and (3) for instructional designers to develop and improve.

The study furthered understanding of the nature of scaffolding in a specific context, the need for evidence on the nature of assistance occurring in an emerging and therefore underresearched learning context (the tabletop computer). Although the current study does not reveal any new scaffolding functions, the investigation into context identified varieties and combinations of scaffolding strategies and tools within interactions, and identified students' use of such strategies and tools as perceived learning opportunities. More knowledgeable peers' employment of scaffolding strategies and tools is identified as a tactic to maximize learning opportunities. Mutual decisions taken by students, both within a single DCSR stage, and from one reading stage to another, showed how they employed available system tools in each stage. Despite the complexity of this tabletop computer-assisted performance, Wood et al.'s (1976) scaffolding features and Lidz's (1991) twelve component behaviours of adult mediating instructions were useful for identifying the scaffolding functions of both verbal and non-verbal peer scaffolding strategies and tools. They were also useful for identifying system scaffolding functions based on students' perceptions of the affordances of the strategies and tools. In other words, a system tool designed for a certain function was not expected to be observed as having the one intended function: one scaffolding tool or strategy could have different scaffolding functions within the same reading task. One final theoretical implication was drawn from the number of scaffolding strategies, tools and functions presented as part of the findings of the present study: that there is a need to develop of taxonomy of scaffolding strategies, tools and their functions to describe students' scaffolding behaviours on the tabletop technology (see Appendix 7).

A number of pedagogical implications for language learning and teaching practice arise from this study. Its findings and discussion provided valuable information that will help teachers understand the nature of social construction of knowledge in an emerging educational context, and the role of peers and the tabletop computer in constructing knowledge and creating learning opportunities. The study has demonstrated the potential advantages of learner-centred approaches in promoting the construction of knowledge without requiring constant attendance by the teacher. From a practical point of view, the study is a real-life demonstration of how tabletop-computer based collaborative reading sessions run in isolation from the teacher; in real classrooms teachers will act as facilitators to several groups of students working at different tabletop computers each occupying four students. Doing so would give the teacher more time to manage and prepare for other simultaneous classroom activities.

The ability of DCSR to record students' activity on the surface of the tabletop computer could be useful in:

- Creating awareness of students' language learning strategies in general and reading comprehension strategies in particular;
- Using such recordings for teachers' reflective practice to give them the opportunities to consider best teaching approaches and the optimal use of language learning materials embedded in the DCSR application.

Students usually engage in variety on-screen activities, for instance specifying the words they consider clunks and choosing fix-up strategies that help them work out a word's meaning. Reviewing the recorded on-screen activity can give the teacher useful information about students' individual problems with vocabulary and other reading comprehension difficulties. This study will also be of use to language instructors and pedagogical software designers, to make modifications to the current application (DCSR) that will increase students' involvement in reading activities and enhance their productive collaboration skills.

I invented material and managerial tools to be embedded in the design of DCSR in order to keep smooth flow of students' interaction, maintain explicit and enforced use of reading comprehension strategies, and help them identify and verbalize their thoughts and problems they face while reading. These tools were capable to cover the constant presence of the teacher, allow for systematic instruction, and provide opportunities for face-to-face and tabletop-based collaboration. Such tools gained more importance due to employment of tabletop computers with ample space for face-to-face collaboration around them, manipulation of various artefacts on the multitouch tabletop surface, and the effective use of the CSR approach. An approach which had positive results in supporting reading comprehension.

The DCSR application can also facilitate conducting further research. For instance, the use of system tools in spoken or written peer feedback, the effect of vocabulary learning tools on students' reading comprehension, and the impact of collaborative writing strategies on reading comprehension. Various issues related to ESL speaking skills and conversations can also be investigated regarding the use of the DCSR application. For example, investigation of the triggers for collaboration, and how DCSR activities can impact speaking skills. With regard to the design of DCSR, future research can consider redesigning DCSR to work on tablets, on digital kitchens to improve reading skills for catering, for school in the cloud (online collaborative reading), or integrated with the Hall-in-the-Wall education project. DCSR can also be integrated with Video Enhanced Observation (VEO) tools to enhance teachers' reflective practice due to (1) the positive impact which VEO gained so far on teacher development and (2) the capability of DCSR, combined with Snag It, to record students' activities on the tabletop computer.

### 7.5 Recommendations for further research

This thesis is an initial effort to investigate and understand the scaffolding process in an emerging technology, the tabletop computer, as a language learning platform. Data analysis suggests various scaffolding strategies, tools and their functions, which are significant to the current study, and they have potential significance for future research.

• The data and their findings suggest considerable potential for future research into peer scaffolding and system scaffolding in a tabletop-assisted language learning context. Alternative ways of conducted future research are possible; for instance, a comparative study of paper-based CSR and digital CSR could (a) examine the ways

in which each form can mediate students' reading comprehension, (b) investigate which is more effective with regard to reading comprehension and assessment tools, and (c) take a broader, less time-constrained approach, including a larger number of participants that will permit both a quantitative and a qualitative analysis of student interaction and a deeper investigation of students' and teachers' responses; and stimulated recall interviews to gain more complete and deeper insights about the phenomena under investigation.

- Some of the concepts identified in the current study, such as scaffolding strategies, tools, scaffolding functions, and students' views about the whole language learning context, could be explored in more detail as stand-alone research topics. These concepts could be researched with regard to the various factors influencing them, to gain further understanding about learning contexts or students' behaviours and discourses.
- The results of this study come from a laboratory research as opposed to a real classroom. There is a need for investigation of scaffolding in a real classroom over a longer period of time to determine the practical application of this technological approach.

# **Bibliography**

- Albrechtsen, H., Andersen, H. K., Bødker, S., and Pejtersen, A. M. (2001). Affordances in activity theory and cognitive systems engineering. Roskilde, Denmark: Riso National Laboratory.
- Alderson, J. C. (1984). Reading in a foreign language: A reading problem or a language problem. In J. C. Alderson and A. H. Urquhart (Eds.), *Reading in a foreign language*, (1-24). London: Longman.
- Aljaafreh, A., and Lantolf, J. P. (1994). Negative feedback as regulation and second language learning in the Zone of Proximal Development. *The Modern Language Journal*, 78 (4), 471-83.
- Almutairi, S. (2014). Managing and analysing task-based interaction in digital tabletop environments. PhD thesis. Newcastle University.
- Anderson, R. C., Spiro, R. J., and Anderson, M. C. (1977). Schemata as scaffolding for the representation of information in connected discourse. Technical report. Centre for the study of reading. University of Illinois at Urbana-Champaign. Available at: https://www.ideals.illinois.edu/bitstream/handle/2142/17579/ctrstreadtechrepv019 77i00024\_opt.pdf?sequence=1
- Anderson, N.J. (1999). Improving reading speed: activities for the classroom. *English teaching forum*, 37, 2-5.
- Anderson, N. J. (2003). Scrolling, clicking and reading English: Online reading strategies in a second/foreign language. *The Reading Matrix*, 3(3), 1-33.
- Anton, M. (1999). The discourse of a learner-centred classroom: sociocultural perspectives on teacher-learner interaction in the second-language classroom. *The Modern Language Journal*, 83(3), 303-317.
- Ausubel, D. P. (1963). *The psychology of meaningful verbal meaning*. Newyork: Grune and Stratton.
- Ausubel, D. P. (1968). *Educational psychology*: A cognitive view. New York: Holt, Rinehart and Winston.
- Barbour, R. and Schostak, J. F. (2005). Interviewing and Focus Groups. In B. Somekh and C. Lewin, (Eds.) *Research Methods in the Social Sciences* (41-48). London: Sage.

Bax, S. (2003). CALL – past, present and future. System, 31 (1), 13–28.

- Baxter, P., and Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. The *Qualitative Report*, 13(4), 544-559.
- Beatty, K. (2003). Teaching and researching computer-assisted language learning. London: Pearson Education.
- Belland, B. R., ChanMin, K., and Hannafin, M. J. (2013). A framework for designing scaffolds that improve motivation and cognition. *Educational Psychologist*, 48 (4), 243-270.
- Belland, B. R., Drake, J., and Liu, Z. (2011). The role of affordances and motives in explaining how and why students use computer-based scaffolds. *Advanced Learning Technologies (ICALT)*, 6-8 July, 11th IEEE International Conference. University of Georgia, USA.
- Bell, P., and Davis, E. A. (2000). Designing Mildred: Scaffolding Students' Reflection and Argumentation Using a Cognitive Software Guide. In B. Fishman & S. O'Connor-Divelbiss (Eds.), *Fourth International Conference of the Learning Sciences* (142-149). Mahwah, NJ: Erlbaum.
- Block, C. and Pressley, M. (2002). Introduction. Comprehension strategies: Research-based best practices (1-7). New York: Guilford Press.
- Boardman, A. G., Klingner, J. K., Boelé, A. L., and Swanson, E. (2010). Teaching students with LD to use reading comprehension strategies. In. T.E. Scruggs and M.A. Mastropieri, eds. *Literacy and Learning*. United Kingdom, Bingley: Emerald Group Publishing Limited, 205-235.
- Bogdan, R. C. and Biklen, S. K. (2006). *Qualitative research for education: An introduction to theory and methods*, 5th edition. Boston: Allyn and Bacon.
- Bonk, C. J., and Kim, K. A. (1998). Extending sociocultural theory to adult learning. In M. C. Smith and T. Pourchot (Ed.), *Adult learning and development: perspectives from educational psychology*, (67–88). Mahwah, NJ: Lawrence Erlbaum Associates.
- Bremer, C., Vaughn, S., Clapper, A., and Kim, A. (2002). Collaborative Strategic Reading (CSR): Improving Secondary Students' Reading Comprehension Skills. *National*

*Center on Secondary Education and Transition*. Available at: http://www.ncset.org/publications/viewdesc.asp?id=424.

- Brush, T., and Saye, J. W. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment. *The Journal of Interactive Online Learning*, 1 (2), 1-12.
- Carrell, P. L. (1989). SLA and classroom interaction: reading. *Annual review of applied linguistics*, 9, 233-242.
- Chang, M. M. (2005). Instructional strategy application in Web-based language teaching and learning. Taipei: Crane Publishing Company.
- Chapelle, C. (1998). Multimedia CALL: Lessons to be learned from research on instructed SLA. *Language Learning and Technology*, 2, 22–34.
- Chen, N., Guimbretiere, F., and Sellen, A. (2012). Designing a multi-slate reading environment to support active reading activities. ACM Trans. Comput.-Hum. Interact, 19 (3), 18-35.
- Clark, K. F., and Graves, M. F. (2004). Scaffolding students' comprehension of text. *International Reading Association*, 570-580.
- Cohen, L., Manion, L. and Morrison, K. (2011). *Research methods in education*. 7th ed. New York: Routledge.
- Coiro, J., and Dobler, E. (2007). Exploring the online reading comprehension strategies used by sixth-grade skilled readers to search for and locate information on the Internet. *Reading Research Quarterly*, 42 (2), 214–257.
- Cook, V. (2008). *Second language learning and language teaching*. 4th ed. London: Hodder Education.
- Creswell, J. W. (2009). Research design: qualitative, quantitative, and mixed methods approaches. 3rd edition. Los Angeles: Sage Publications.
- Creswell, J. W. and Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, 39 (3), 124-131.
- Davies, G., Walker, R., Rendall, H., and Hewer, S. (2012) Introduction to Computer Assisted Language Learning (CALL). Module 1.4 in Davies G. (ed.) *Information and*

*Communications Technology for Language Teachers (ICT4LT)*, Slough, Thames Valley University. Available at: http://www.ict4lt.org/en/en\_mod14.htm

- De Guerrero, M. C. M., and Villamil, O. S. (2000). Activating the ZPD: Mutual scaffolding in L2 peer revision. *The Modern Language Journal*, 84 (1), 51-68.
- Dillenbourg, P. and Evans, M. (2011). Interactive tabletops in education. *International Journal of Computer-Supported Collaborative Learning*, 6 (4), 491-514.
- Donato, R. (1994). Collective scaffolding in second language learning. In J. P. Lantolf and G.
   Appel (Eds.), *Vygotskian approaches to second language research* (33–56).
   Ablex Publishing Corporation, Norwood: NJ.
- Donato, R. (2000). Sociocultural contributions to understanding the foreign and second language classroom. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning* (27-50). Oxford: Oxford University Press.
- Donato, R. (2004). Aspects of collaboration in pedagogical discourse. *Annual Review of Applied Linguistics*, 24, 284-302.
- Duffy, T. and Cunningham, D. J. (1996). Constructivism: Implications for the design and delivery of instruction. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (170-198). New York: Simon and Schuster Macmillan.
- Egbert, J. (2005). CALL essentials: principles and practice in CALL classrooms. *TESOL Inc.*: Alexandria.
- Eiriksdottir, E., and Catrambone, R. (2011). Procedural Instructions, Principles, and
  Examples: How to Structure Instructions for Procedural Tasks to Enhance
  Performance, Learning, and Transfer. Human factors: *The journal of the human factors and ergonomics society*, 53 (6), 749-770.
- Ellis, R. (2000). Task-based research and language pedagogy. *Language Teaching Research*, 4(3), 193-220.
- Falcão, T. P., and Price, S. (2011). Interfering and resolving: How tabletop interaction facilitates co-construction of argumentative knowledge. *ijcscl*, 6(4), 539-559.
- Fan, Y-C. (2009). Implementing Collaborative Strategic Reading (CSR) in an EFL Context in Taiwan. PhD thesis. University of Leicester.

- Fasheh, M. J. (1995). The reading campaign experience with Palestinian society: innovative strategies for learning and building community. *Hardvard Educational Review*, 65, 66-92.
- Ferna´ndez, M., Wegerif, R., Mercer, N., and Rojas-Drummond, S. (2001). Reconceptualizing "scaffolding" and the zone of proximal development in the context of symmetrical collaborative learning. *The Journal of Classroom Interaction*, 40-54.
- Fontana, A., and Frey, J. H. (1994). Interviewing: The art of science. In N. K. Denzin and Y.
  S. Lincoln (Eds.), *Handbook of qualitative research* (361-376). Thousand Oaks: Sage Publications.
- Fretz, E. B., Wu, H., Zhang, B., Krajcik, J. S., and Soloway, E. (2002). An investigation of software scaffolds supporting modelling practices. *Research in Science Education*, 32, 567-589.
- Garrett, N. (2009). Computer-assisted language learning trends and issues revisited: Integrating innovation. *The Modern Language Journal*, 93 (1), 719-740.
- Griffin, C. (2003). The advantages and limitations of qualitative research in psychology and education. *Sci Ann Psychol Soc North Greece*, 2, 3-15.
- Gutiérrez, A. G. (2006). Sociocultural theory and its application to CALL: A study of the computer and its relevance as a mediational tool in the process of collaborative activity. *ReCALL*, 18 (2) 230-251.
- Gutiérrez, A. G. (2008). Microgenesis, method and object: A study of collaborative activity in a Spanish as a foreign language classroom. *Applied Linguistics*, 29, 120-48.
- Glew, P. (1998). Verbal interaction and English second language acquisition in classroom contexts. *Issues in Educational Research*, 8, 83–94.
- Grabe,W. (2009). Reading in a second language: Moving from theory to practice. Cambridge: Cambridge University Press.
- Grabe, W. (2004). Research on teaching reading. *Annual Review of Applied Linguistics*, 24, 44-69.
- Grabe, W. (1991). Current developments in second language reading. *TESOL Quarterly*, 25, 375-396.

- Grabe, W., and Stoller, F. L. (2002). *Teaching and Researching Reading*. Harlow: Pearson Education.
- Hafiz, F.M., and Tudor, I. (1989). Extensive reading and the development of language skills. English Language Teaching Journal, 43, 4-11.
- Harasim, L., Hiltz, S., Teles, L., and Turoff, M. (1995). *Learning Networks*. Cambridge, MA, MIT.
- Harris, A., Rick, J., Bonnett, V., Yuill, N., Fleck, R., Marshall, P., and Rogers, Y. (2009).
  Around the table: are multiple-touch surfaces better than single-touch for children's collaborative interactions? *Proceedings of the 9th international conference on Computer supported collaborative learning*, Vol. 1, International Society of the Learning Sciences, (335-344).
- Heins, B., Duensing, A., Stickler, U. and Batstone, C. (2007). Spoken Interaction in Online and Face-to-face Language Tutorials. *Computer Assisted Language Learning*, 20 (3), 279-295.
- Hennessy, E. (2012). How am I learning to scaffold a synchronous online professional development course?. *Educational Journal of Living Theories*, 5 (2), 1-43.
- Heslop, P., Preston, A., Kharrufa, A., Balaam, M., Leat, D., Olivier, P. (2015). Evaluating Digital Tabletop Collaborative Writing in the Classroom. *In: Human-Computer Interaction–INTERACT 2015: 15th IFIP TC 13 International Conference*. Bamberg, Germany: Springer International Publishing.
- Hicks, D., and Doolittle, P. E. (2008). Fostering analysis in historical inquiry through multimedia embedded scaffolding. *Theory and Research in Social Education*, 3, 206-232.
- Higgins, S., Mercier, E., Burd, L., and Joyce-Gibbons, A. (2012). Multi-touch tables and collaborative learning. *British Journal of Educational Technology*, 43 (6), 1041-1054.
- Higgins, S., Mercier, E., Burd, E. and Hatch, A. (2011). Multi-touch tables and the relationship with collaborative classroom pedagogies: A synthetic review.
   *International Journal of Computer-Supported Collaborative Learning* 6 (4), 515-538.

- Hicks, D., and Doolittle, P. E. (2008). Fostering analysis in historical inquiry through multimedia embedded scaffolding. *Theory and Research in Social Education*, 36 (3), 206-232.
- Holton, D., and Clarke, D. (2006). Scaffolding and metacognition. International Journal of Mathematical Education in Science and Technology, 37 (2), 127-143.
- Holton, D., and Thomas, G. (2006). Mathematical Interactions and Their Influence on Learning. In D. Clarke (Ed.), *Perspectives on Practice and Meaning in Mathematics and Science Classrooms Mathematics Education Library*. Dordrecht: Springer, 74-104.
- Hornecker, E., Marshall, P., Dalton, S., and Rogers, Y. (2008). Collaboration and interference: Awareness with mice or touch input. *Proceedings of the Conference* on Computer Supported Cooperative Work. San Diego, USA: ACM Press.
- Huckin, T., and Bloch, J. (1993). Strategies for inferring word meaning in context. In T. Huckin, M. Haynes, and J. Coady (Eds.), *Second language reading and vocabulary learning*, (153-178). Norwood, NJ: Ablex.
- Jackson, S. L., Stratford, S. J., Krajcik, J., and Soloway, E. (1994). Making dynamic modeling accessible to precollege science students. *Interactive Learning Environments*, 4, 233-257.
- Jackson, S. L., Krajcik, J., and Soloway, E. (1998). The Design of Guided Learner-Adaptable Scaffolding in Interactive Learning Environments, *Proceedings of CHI 1998*.
- Jaworski, A. and Coupland, N. (2006). Introduction: Perspectives on discourse analysis. In Jaworski and Coupland (Eds.) *The discourse reader*, 2nd ed, (1-11). London: Routledge,.
- Joyce-Gibbons, A. (2014). An exploratory study of teacher orchestration of collaborative Mathematics tasks in relation to learning and interaction in primary schools. PhD thesis. Durham University.
- Jenks, Christopher. (2011). Transcribing talk and interaction: Issues in the representation of communication data. John Benjamins.

Johnson, D. M. (2004). A philosophy of second language acquisition. Yale University Press.

- Johnson, D. W., and Johnson, R. T. (1996). Cooperation and the use of technology. In D. H. Jonassen (Ed.), *Handbook of research for educational communications and technology*, (785-812). New York: Simon and Schuster.
- Johnson, K. (1995). Understanding communication in second language classrooms. Cambridge: Cambridge University Press.
- Kern, R. (2006). Perspectives on Technology in Learning and Teaching Languages. *TESOL Quarterly*, 40 (1), 183–210.
- Kharrufa, A. S. (2010). *Digital tabletops and collaborative learning*. PhD thesis. Newcastle University.
- Kharrufa A, and Olivier P. (2010). Exploring the requirements of tabletop interfaces for education. *International Journal of Learning Technology*, 5 (1), 42-62.
- Kharrufa A, Martinez-Maldonado R, Kay J, and Olivier P. (2013). Extending tabletop application design to the classroom. *ACM international conference on Interactive tabletops and surfaces*. ACM.
- Kharrufa A, Balaam M, Heslop P, Leat D, Dolan P, and Olivier P. (2013). Tables in the Wild: Lessons Learned from a Large-Scale Multi-Tabletop Deployment. In CHI 2013: Proceedings of the SIGCHI Conference on Human Factors in Computing Systems. Paris: ACM.
- Kim, A-H., Vaughn, S., Klingner, A., Woodruff, A.L., Reutebuch, C.K., and Kouzekanani, K. (2006). Improving the reading comprehension of middle school students with disabilities through computer-assisted collaborative reading. *Remedial and Special Education*, 27 (4), 235-249.
- King, A. (1991). Effects of training in strategic questioning on children's problem-solving performance". *Journal of Educational psychology*, 83 (3), 307-317.
- Kitade, K. (2000). L2 learners' discourse and SLA theories in CMC: Collaborative interaction in internet chat. *Computer Assisted Language Learning*, 13 (2), 143-166.
- Klingner, J. K., and Vaughn, S. (1998). Using Collaborative strategic reading. *Teaching Exceptional Children*, 30 (6), 32-37. Available at http://www.ldonline.org/article/103.

- Klingner, J. K., Vaughn, S., and Schumm, J. S. (1998). Collaborative strategic reading during social studies in heterogeneous fourth-grade classrooms. *The Elementary School Journal*, 99 (1), 3-22.
- Klingner, J. K., and Vaughn, S. (1999). Promoting reading comprehension, content learning, and English acquisition through collaborative strategic reading (CSR). *The Reading Teacher*, 52, 738-747.
- Klingner, J. K., and Vaughn, S. (2000). The helping behaviours of fifth graders while using collaborative strategic reading during ESL content classes. *TESOL Quarterly*, 34 (1), 69-98.
- Koda, K. (2005). Insights into second language reading: A Cross-linguistic approach. Cambridge: Cambridge University Press.
- Kolodner, J. L., Camp, P. J., Crismond, D., Fasse, B., Gray, J., Holbrook, J., Puntambekar, S., and Ryan, M. (2003). Problem-Based Learning Meets Case-Based Reasoning in the Middle-School Science Classroom: Putting Learning by Design<sup>™</sup> Into Practice. *The Journal of the Learning Sciences*, 12 (4), 495-547.
- Kramsch, C. (2002). Language acquisition and language socialization: Ecological Perspectives. London: Continuum.
- Kramsch, C., and Steffensen, S. V. (2008). Ecological perspectives on second language acquisition and socialization. In P. A. Duff and N. H. Hornberger (Eds.), *Encyclopedia of Language and Education*, Vol. 8, (17-28). New York: Springer.
- Krashen, S. D. (1985). The Input Hypothesis: Issues and Implications. New York: Longman.
- Kruger, R., Carpendale, S., Scott, S. D., and Greenberg, S. (2003). How people use orientation on tables: comprehension, coordination and communication. In *GROUP '03: Proceedings of the 2003 International ACM SIG GROUP Conference on Supporting Group Work*, 369-378.
- Kruger, R., Carpendale, S., Scott, S. D., and Greenberg, S. (2004). Roles of orientation in tabletop collaboration: comprehension, coordination and communication. *Computer Supported Cooperative Work*, 13 (5-6), 501-537.
- Kurata, N. (2011). Foreign language learning and use: Interaction in informal social networks. London: Continuum.

- LaBerge, D., and Samuels, S. J. (1974). Toward a theory of automatic information processing in reading. *Cognitive Psychology*, 6, 293-323.
- Langer, J.A., and Applebee, A. N. (1986). Reading and Writing Instruction: Towards a Theory of Teaching and Learning. In Rothkopf, E.Z. (Ed.) *Review of Research in Education*. Vol. 13 (171-194). Washington, D.C.: American Educational Research Association.
- Lantolf, J. P. (2000). Introducing Sociocultural Theory. In Lantolf, J.P. (Ed.) *Sociocultural Theory and Second Language Learning*. Oxford: Oxford University Press.
- Lantolf, J. P. (2005). Sociocultural and second language learning and research: An exegesis.
   In. E. Hinkel, (Ed.) *Handbook of research in second language learning and teaching*. Mahwah, NJ: Lawrence Erlbaum Associates, 335-353.
- Lantolf, J. P., and Thorne, S. L. (2006). *Sociocultural theory and the genesis of second language development*. Oxford: Oxford University Press.
- Laru, J., Järvelä, S., and Clariana, R. B. (2012). Supporting collaborative inquiry during a biology field trip with mobile peer-to-peer tools for learning: A case study with K -12 learners. *Interactive Learning Environments*, 20 (2), 103-117.
- Lave, J., and Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge: Cambridge University Press.
- Leat, D. and Nicholas, A. (2010). Brains on the table: diagnostic and formative assessment through observation. *Assessment in Education: Principles, Policy and Practice*, 7 (1),103–121.
- Leather, J., and van Dam, J. (2003). Ecology of language acquisition. Kluwer: Dordrecht.
- Leontyev, A. N. (1979). The problem of activity in psychology. In J.V. Wertsch (Ed.) *The concept of activity in Soviet psychology*, (37-71). Armonk, NY: Sharpe.
- Levy, M. (1997). Computer-assisted language learning: Context and conceptualization. Oxford: Clarendon.
- Liaw, M. (2007). Constructing a 'third space' for EFL learners: Where language and cultures meet. *ReCALL*, 19 (2), 224-241.
- Lidz, C. (1991). Practitioner's Guide to Dynamic Assessment. New York: Guilford Press.

- Lightbown, P. M., and Spada, N. (1999). *How languages are learned*. Oxford: Oxford University Press.
- Long, M. H. (1996). The role of the linguistic environment in second language acquisition. In.W. Ritchie, and T.K. Bhatia, (Eds.) *Handbook of second language acquisition*.New York: Academic Press, 413-468.
- Marshall, C. C., Price, M. N., Golovchinsky, G., and Schilit, B. N. (1999). Introducing a digital library reading appliance into a reading group. In *Proceedings of the 4th* ACM Conference on Digital Libraries (DL'99). 77–84.
- Maslamani, J. A., Windeatt, S., Olivier, P., Heslop, P., Kharrufa, A., Shearer, J., and Balaam, M. (2012). Collaborative Strategic Reading on Multi-Touch and Multi-User
  Digital Tabletop Displays. In L. Bradley and S. Thouësny, (Eds.) *CALL: Using, Learning, Knowing, EUROCALL Conference*, Gothenburg, Sweden, 22-25, Proceedings, 211-216.
- Mercier, E.M. and Higgins, S.E. (2014). Creating Joint Representations of Collaborative Problem Solving with Multi-touch Technology. *Journal of Computer Assisted Learning*, 30 (6), 497-510.
- Mercier, E.M. and Higgins, S. (2013). Collaborative learning with multi-touch technology: Developing adaptive expertise. *Learning and Instruction*, 25, 13-23.
- Mercier, E., Vourloumi, G. and Higgins, S. (2015). Student interactions and the development of ideas in multi-touch and paper-based collaborative mathematical problem solving. *British Journal of Educational Technology*. Available at: http://onlinelibrary.wiley.com/doi/10.1111/bjet.12351/epdf
- Miles, M. B., & Huberman, A. M. (1994). Qualitative data analysis: An expanded source book (2nd ed.). Thousand Oaks, CA: Sage.
- Morris, M. R., Piper, A. M., Cassanego, A., and Winograd, T. (2005). Supporting cooperative language learning: Issues in interface design for an interactive table: Technical report. Stanford University.
- Norris, J. and Ortega, L. (2003). Defining and measuring SLA. In. C. Doughty and M. Long, (Eds), *The Handbook of Second Language Acquisition*. Oxford: Blackwell Publishing, 717-761.

- Nye, B. D., and Silverman, B. G. (2012). Affordance. In N. M. Seel, (Ed). *Encyclopaedia of the Sciences of Learning*, 179-183.
- Ohta, A.S. (1995). Applying sociocultural theory to an analysis of learner discourse: Learnerlearner collaborative interaction in the zone of proximal development. *Issues in Applied Linguistics*, 6 (2), 93-121.
- Ohta, A. S. (2000). Rethinking interaction in SLA: Developmentally appropriate assistance in the zone of proximal development and the acquisition of grammar. In J. Lantolf (Ed). *Sociocultural theory and second language learning* (51-78). Oxford: Oxford University Press.
- Oortwijn, M. B., Boekaerts, M., Vedder, P., & Strijbos, J. (2008). Helping behaviour during cooperative learning and learning gains: The role of the teacher and of pupils' prior knowledge and ethnic background. *Learning and Instruction*, (18), 146-159.
- Palinscsar, A.S. and Brown, A.L. (1984). The reciprocal teaching of comprehension fostering and comprehension monitoring activities. *Cognition and Instruction*, 1, 117-175.
- Pea, R. D. (2004). The social and technological dimensions of scaffolding and related theoretical concepts for learning, education, and Human Activity. *Journal of the Learning Sciences*, 13:3, 423-451.
- Petsangsri, S. (2002). The Effects of Embedded Scaffolding Strategy in a Cognitive Flexibility-Based Computer Learning Environment. *International Conference on Computers in Education (ICCE'02)*, 75-79.
- Pica, T. (1994). Research on negotiation: What does it reveal about second language learning conditions, processes and outcomes? *Language Learning*, 44 (3), 493-527.
- Poehner, M.E. (2008). Dynamic Assessment: A Vygotskian Approach to Understanding and Promoting Second Language Development. Berlin: Springer Publishing.
- Pressley, M., Brown, R., El-Dinary, P. B., and Afflerbach, P. (1995). The comprehension instruction that students need: Instruction fostering constructively responsive reading. *Learning Disabilities Research and Practice*, 10, 215-224.
- Pressley, M., Hogan, K., Wharton-McDonald, R., Mistretta, J., and Ettenberger, S. (1996). The challenges of instructional scaffolding: The challenges of instruction that

supports student thinking. *Learning Disabilities Research and Practice*, 11, 138-146.

- Pretorius, E.J. (2000). What they can't read will heart them: reading and academic achievement. *Innovation*, 21, 33-41.
- Price, S., and Falcão, T. (2011). Where the attention is: discovery learning in novel tangible environments. *Interacting with Computers*, 23 (5), 499-512.
- Puntambekar, S., and Hübscher, R. (2005). Tools for scaffolding students in a complex environment: What have we gained and what have we missed? *Educational Psychologist*, 40 (1), 1-12.
- Pykhtina, O., Balaam, M., Wood, G., Pattison, S., Kharrufa, A., and Olivier, P. (2012). Magic Land: the design and evaluation of an interactive tabletop supporting therapeutic play with children. *DIS 2012 Conference*, June 11-15, 2012, Newcastle, UK.
- Quintana, C., Reiser, B. J., Davis, E. A., Krajcik, J., Golan, R., Kyza, E. A., et al. (2002).
  Evolving a scaffolding design framework for designing educational software. In
  P. Bell, R. Stevens, and T. Satwicz (Eds.), *Keeping learning complex: The Proceedings of the Fifth International Conference of the Learning Sciences* (359-366). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Reiser, B. J., Tabak, I., Sandoval, W. A., Smith, B., Steinmuller, F., and Leone, A. J. (2001).
   BGuILE: Strategic and conceptual scaffolds for scientific inquiry in biology classrooms. In S.M. Carver&D.Klahr (Eds.), *Cognition and Instruction: Twenty-five years of progress* (263–305). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Renshaw, P. (2013). The social cultural and emotional dimensions of scaffolding. *Learning, Culture and Social Interaction*, 2(1).
- Resta, P., and Laferrière, T. (2007). Technology in support of collaborative learning. *Educational Psychology Review*, 19 (1), 65-83.
- Richards, J. C., and Eckstut, S. (2003). *Strategic reading2: Building effective reading skills*. Cambridge University Press.
- Rick, J. (2009). Towards a classroom ecology of devices: interfaces for collaborative scripts. In: *Workshop Proceedings of 8th International Conference on Computer*

*Supported Collaborative Learning (CSCL2009)*: "Scripted vs. Free CS collaboration: alternatives and paths for adaptable and flexible CS scripted collaboration", 8-13 June 2009, Rhodes, Greece.

- Rojas-Drummond, S., and Mercer, N. (2003). Scaffolding the development of effective collaboration and learning. *International Journal of Educational Research*, 39 (1), 99-111.
- Rogers, Y., Lim, Y., Hazlewood, W. R., and Marshall, P. (2008). Equal opportunities: Do shareable interfaces promote more group participation than single user displays? *Human Computer Interaction*, 24 (2), 79–116.
- Salomon, G., Globerson, T., and Guterman, E. (1989). The computer as a zone of proximal development: Internalizing reading-related metacognitions from a reading partner. *Journal of Educational Psychology*, 81(4), 620–627.
- Samuels, S. and Kamil, M. (1984). Models of the Reading Process. In. P. David Pearson, (Ed.), *Handbook of Reading Research*. Vol. 1. New York: Longman, 185-224.
- Samuels, S., and Kamil, M. L. (1988). Models of the reading process. In P. L. Carrell & D. E. Eskey (Eds.), *Interactive approaches to second language reading* (pp. 22-36). New York: Cambridge University Press.
- Saville-Troike, M. (1984). What really matters in second language learning for academic purposes? *TESOL Quarterly*, 18, 199-219.
- Scardamalia, M., and Bereiter, C. (1985). Fostering the development of self-regulation in children's knowledge processing. In S. F. Chipman, J. W. Segal, & R. Glaser (Eds.), *Thinking and learning skills: Research and open questions* (Vol. 2), (563-577). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Scott, S. D., Grant, K. D. and Mandryk, R. L. (2003) System guidelines for co-located collaborative work on a tabletop display', in *Proceedings of ECSCW'-3: European Conference on Computer-Supported Cooperative Work*, 159-178.
- Seedhouse, P. (1997). The case of the missing "no": the relationship between pedagogy and interaction. *Language Learning*, 47, 547-583.
- Seedhouse, P., and Almutairi, S. (2009). A Holistic Approach to Task-Based Interaction. International Journal of Applied Linguistics, 19, 311-338.
- Sherin, B., Reiser, B. J., and Edelson, D. (2004). Scaffolding analysis: extending the scaffolding metaphor to learning artefacts. *The Journal of the Learning Sciences*, 13 (3), 387-421.
- Shuell, T. J. (1990). Phases of meaningful learning. *Review of Educational Research*, 60 (4), 531-547.
- Silverman, D. (2013). Doing Qualitative Research (4th Ed). London: Sage Publications Ltd.
- Simpson, M. and Tuson, J. (1997) Using observation in small-scale research: A beginner's guide. Edinburgh: SCRE.
- Sinatra, A.M. (2014). Utilizing the Generalized Intelligent Framework for Tutoring to Encourage Self-Regulated Learning. In *Foundations of Augmented Cognition*. *Advancing Human Performance and Decision-Making through Adaptive Systems*.
  8th International Conference, AC 2014, Held as Part of HCI International 2014, Heraklion, Crete, Greece, June 22-27.
- Sluis, W., Weevers, I., van Schijndel, C.H.G J., Kolos-Mazuryk, L., Fitrianie, S., Martens, J.B.O.S. (2004). Read-It: five-to-seven-year-old children learn to read in a tabletop environment. Proceedings of the 2004 conference on Interaction design and children: building a community. Maryland 2004. pp 73-80.
- Smithson, J. (2008). Focus Groups. In P. Alasuutari, L. Bickman, and J. Brannen (Eds.), *The SAGE Handbook of Social Research Methods*. London: Sage Publication Limited, 357-369.
- Soloway, E., Guzdial, M., and Hay, K. E. (1994). Learner-centered design: The challenger for HCI in the 21<sup>st</sup> century. *Interactions*, 1, 36-48.
- Stahl, G. (2006). Group cognition: computer support for building collaborative knowledge. MIT Press.
- Stockwell, G., (2012). Introduction. In G. Stockwell, (Ed.) Computer-Assisted Language Learning: Diversity in Research and Practice. Cambridge: Cambridge University Press, 1-13.
- Sun, Y. C. (2003). Extensive reading online: An overview and evaluation. Journal of Computer-Assisted Learning, 19 (4), 438-447.

- Swain, M. (2000). The output hypothesis and beyond: Mediating acquisition through collaborative dialogue. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning*, (97-114). Oxford: Oxford University Press.
- Tan, T.-H., Lin, M.-S., Chu, Y.-L., & Liu, T.-Y. (2012). Educational Affordances of a Ubiquitous Learning Environment in a Natural Science Course. *Educational Technology and Society*, 15 (2), 206-219.
- Tharp, R., and Gallimore, R. (1988). *Rousing Minds to Life: Teaching, Learning and Schooling in Social Context*. Cambridge: Cambridge University Press.
- Toth, E., E., Suthers, D. D., and Lesgold, A. M. (2002). "Mapping to know": The effects of representational guidance and reflective assessment on scientific inquiry. *Science Education*, 86, 264-286.
- Tse, E., Shen, C., Greenberg, S., and Forlines, C. (2007). How pairs interact over a multimodal digital table. *CHI 2007 Conference*, April 28-May 3, 2007, San Jose, California, USA.
- Urquhart, S., and Weir, C. (1998) *Reading in a second language: Process, product, and practice.* London and New York: Longman.
- van Lier, L. (1996). Interaction in the language curriculum: Awareness, autonomy and authenticity. New York: Longman.
- van Lier, L. (2000). From input to affordance: social-interactive learning from an ecological perspective. In J. P. Lantolf (Ed.), *Sociocultural theory and second language learning* (245-259). Oxford: Oxford University Press.
- van Lier, L. (2004). The ecology and semiotics of language learning: A sociocultural perspective. Boston: Kluwer Academic.
- van, Lier, L. (2011). Language Learning: An Ecological-Semiotic Approach. In E. Hinkel
   (Ed.), Handbook or Research in Second Language Teaching and Learning, 283-394. Routledge: UK.
- Vaughn, S., and Klingner, J. K. (1999). Teaching reading comprehension through collaborative strategic reading. *Intervention in School and Clinic*, 34 (5), 284-292.

- Vaughn, S., Klingner, J. K., and Bryant, D.P. (2001). Collaborative strategic reading as a means to enhance peer-mediated instruction for reading comprehension and content-area learning. *Remedial and Special Education*, 22 (2), 66-74.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Vygotsky, L. S. (1986). Thought and language. Cambridge, MA: MIT Press.
- Warschauer, M. (2005). Sociocultural perspectives on CALL. In J. Egbert and G. M. Petrie, eds. CALL Research Perspectives, 41-51.
- Walsh, S. (2006). Investigating classroom discourse. London: Routledge.
- Walsh, S. (2011). Exploring classroom discourse: Language in action. London: Routledge.
- Walsh, S. (2012). Conceptualising Classroom Interactional Competence', Novitas-ROYAL (Research on Youth and Language), 6 (1), 1-14.
- Waycott, J., Jones, A., and Scanlon, E. (2005). PDAs as lifelong learning tools: an activity theory based analysis. *Learning, Media and Technology*, 30 (2), 107-130.
- Webb, N. M., and Farivar, S. (1994). Promoting helping behavior in cooperative small groups in middle school mathematics. *American Educational Research Journal* (31), 369-395.
- Webb, N. M., and Mastergeorge, A. M. (2003). The development of students' helping behavior and learning in peer-directed small groups. *Cognition and Instruction*, 361-428.
- Webb, N. M., Nemer, K. M., and Ing, M. (2006). Small group reflections: parallels between teacher discourse and student behavior in peer-directed groups. *The Journal of the Learning Sciences*, (15), 63-119.
- Webb, N. M., Troper, J. D., and Fall, R. (1995). Constructive activity and learning in collaborative small groups. *Journal of Educational Psychology*, (87), 406-423.
- Wertsch, J., V. (1998). Mind as Action. Oxford University Press, New York.
- Wood, D., and Middleton, D. (1975). A study of assisted problem-solving. British Journal of Psychology, 66 (2), 181-191.

- Wood, D., Bruner, J., and Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Child Psychiatry*, 17, 89-100.
- Wood, D. J., Wood, H. A., and Middleton, D. J. (1978). An experimental evaluation of four face-to-face teaching strategies. *International Journal of Behavioral Development*, 1, 131-147.
- Yin, R. (2009). Case study research: Design and methods. 4th ed. London: Sage Publications.
- Ziglari, L. (2012). Affordance and second language learning. In N. M. Seel, (Ed.), Encyclopedia of the Sciences of Learning, 175-179.
- Zangori, L., Forbes, C.T., and Schwarz, C.V. (2015). Exploring the effect of embedded scaffolding within curricular tasks on third-grade students' model-based explanations about hydrologic cycling. *Sci and Educ*, 24, 957–981.

### **Appendix 1: Paper Prototype 1**





# **Appendix 2: Paper Prototype 2**





















#### **Appendix 3: Paper Prototype 3**









#### Appendix 4: Wood et al's. (1976) six scaffolding functions

1. *Recruitment.* The tutor's first and obvious task is to enlist the problem solver's interest in and adherence to the requirements of the task. In the present case, this often involved getting the children not only interested, but weaned from initial imaginative play with the blocks.

2. Reduction in degrees of freedom. This involves simplifying the task by reducing the number of constituent acts required to reach solution. It was N. Bernstein (1967) who first pointed to the importance of reducing the alternative movements during skill acquisition as an essential to regulating feedback so that it could be used for correction. In the present instances it involved reducing the size of the task to the level where the learner could recognize whether or not he had achieved a "fit" with task requirements. In effect, the "scaffolding" tutor fills in the rest and lets the learner perfect the component sub-routines that he can manage.

3. Direction maintenance. Learners lag and regress to other aims, given limits in their interests and capacities. The tutor has the role of keeping them in pursuit of a particular objective. Partly it involves keeping the child "in the field" and partly a deployment of zest and sympathy to keep him motivated. The children often made their constructions in order to show them to the tutor. In time, the activity itself became the goal—but even then, the older children often checked back.

One other aspect of direction maintenance is worth mention. Action, of course, tends to follow the line of previous success. There were instances, for example when subjects would work successfully (and apparently endlessly) on constructing pairs, rather than moving on from this success at a simpler level to trying out a more complex task—like the construction of a flat quadruple. Past success served to distract from the ultimate goal. The effective tutor also maintains direction by making it worthwhile for the learner to risk a next step.

4. Marking critical features. A tutor by a variety of means marks or accentuates certain features of the task that are relevant. His marking provides information about the discrepancy between what the child has produced and what he would recognize as a correct production. His task is to interpret discrepancies.

5. Frustration control. There should be some such maxim as "Problem solving should be less dangerous or stressful with a tutor than without". Whether this is accomplished by "face saving" for errors or by exploiting the learner's "wish to please" or by other means, is of only minor importance. The major risk is in creating too much dependency on the tutor.

6. Demonstration. Demonstrating or "modelling" solutions to a task, when closely observed, involves considerably more than simply performing in the presence of the tutee. It often involves an "idealization" of the act to be performed and it may involve completion or even explication of a solution already partially executed by the tutee himself. In this sense, the tutor is "imitating" in idealized form an attempted solution tried (or assumed to be tried) by the tutee in the expectation that the learner will then "imitate" it back in a more appropriate form.

### Appendix 5: Lidz's (1991) Twelve Components Behaviours of Adult Mediating Instruction

Lidz's (1991) Twelve Component Behaviors of Adult Mediating Instruction

- 1. *Intentionality*: Consciously attempting to influence the child's actions. This involves making efforts to keep the interaction going, engage the child's attention, inhibit impulsive behavior, and maintain goal orientation.
- 2. *Meaning*: Promoting understanding by highlighting for the child what is important to notice, marking relevant differences, elaborating detail, and providing related information.
- 3. *Transcendence*: Helping the child make associations to related past experiences and project himself or herself into the future.
- 4. Joint regard: Trying to see the activity through the child's eyes; looking at an object that has been brought into focus by the child; using "we" to talk about the experience.
- 5. Sharing of experiences: Telling the child about an experience or thought that the mediator had and of which the child is not aware.
- 6. *Task regulation*: Manipulating the task to facilitate problem solving; stating a principle of solution or inducing strategic thinking in the child.
- 7. Praise/Encouragement: Communicating to the child, verbally or nonverbally, that he or she has done something good; keeping high the child's self-esteem.
- Challenge: Maintaining the activity within the limits of the child's ZPD. This implies challenging the child to reach beyond his or her current level of functioning, but not so much that the child will feel overwhelmed and get discouraged.
- Psychological differentiation: Keeping in mind that the task is the child's and not the mediator's; that the goal is for the child to have a learning experience, not the adult. Avoiding competitiveness with the child.
- 10. Contingent responsivity: The ability to read the child's behavior and to respond appropriately. It can be compared to a well-coordinated dance between two partners who are very much in tune to one another.
- 11. Affective involvement: Expressing warmth to the child; giving the child a sense of caring and enjoyment in the task.
- 12. Change. Communicating to the child that he or she has made some change or improved in some way.

Note. This table represents a synthesis of information from *Practitioner's Guide to Dynamic Assessment*, by Carol S. Lidz, 1991, New York: Guilford Press. Copyright 1991 by The Guilford Press. Adapted with permission.

## Appendix 6: Stages of Analysis of Collaborative Reading Sessions





Appendix 7: Taxonomy of Scaffolding Strategies, Tools, and their Functions

# Appendix 8: Participants' consent form

	<b>Newcastle</b> University
Consent Form for Participants	s
The title of the study is "collaborative readil research. At the end of the project, a thesis of	ng on tabletop computers" which is conducted for a PhI will be written to report the findings.
Read each statement and tick the appropriat	te boxes:
I agree to take part in this study. opportunity to ask any questions ab study at any time without giving a re-	This agreement is of my own free will. I have had the bout the study and I realise that I may withdraw from the ason.
I have been given full information re information with the Researcher's r further information. All personal information.	egarding the aims of the research and have been giver name on and a contact number and address if I require rmation provided by myself will remain confidential.
I understand that I will do the follo individually and collaboratively, write with other peers the main ideas and recall test and a cloze reading test understand that I will answer intervie	wing: In a group of four participants, I will read a tex e short notes and summaries while reading, and discuss d details of the reading texts. I will also complete a written st after every session, and a pre- and post-test. I also ew questions and fill a questionnaire.
I understand that I am free to ask an	y questions at any time before and during the study.
I understand that my backgroup questionnaire and tests will be store in this study.	und information, video recorded session, interview ad in a password-protected file and used as a data source
I agree to my video recorded sessi who are not part of this study. I do r	ions to be shown and discussed with some other people not agree $\Box$
☐ I agree to my video recorded ses posters or press). I do not agree □	ssions to be used as a promotional video (in website 1
Name of participant (print) :	
Email Address	
Telephone number (optional) :	
Signature :	***
Contact details:	
Jaber Maslamani (Researcher)	Scott Windeatt (Supervisor)
Room B83, ILab-Learn, King George VI Building	King George VI Building
School of Education, Communication and	School of Education, Communication and
Language Sciences	Language Sciences
Newcastle University	Newcastle University Queen Victoria Road
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NE1 7RU	NE1 7RU
Email: jaber.maslamani@newcastle.ac.uk Telephone: 07515171948	Email: <u>scott.windeatt@newcastle.ac.uk</u>

#### **Appendix 9: Transcription of session 1/5 audio (sample)**

Key:

- Me: Researcher
- P1 (Dim): Participant 1—male
- P2 (Lada): Participant 2 female
- P3 (Carl): Participant 3 male
- P4 (Beta): Participant 4 female
- P3: It's just we have to write, that we already know about this word, not, it's not like a summarise, it's what you already know, ok?
- P1: ah, about the topic, yeah you're right.
- P3: Ok.
- P1: Ok, so, can delete all of this.
- P3: let go
- P4: but move, there are here.. what happened with your reading?
- P2: that's... no problem
- P1: do you need a hand?
- P2: I think that it is..
- Me: Ok guys, I'm going outside for like six minutes, and I'm gonna come back. Don't forget the grouping thing. The grouping when you get, when you are finished from this, you need to put them in groups. So the circle that has the groups will come in themiddle, yeah? So sometimes and maybe the trash will cover it, so move the trash you will find it in the middle. So you touch add group and you will have group thing, so you write the name.
- P1: and err when we..
- Me: yes that's after you've click done, you will have that. But you decide first, should you move it or not. I'll be back, maybe six minutes.
- P3: Ok.
- P1: err, this one?
- Me: Oh I see the question mark?
- P1: no, no, this.. the flash, the flash..
- Me: it's not working yeah? It gives you upside down. So yeah that's a problem from the 101 computer itself

P1: ok ok

Me: just write whatever you want.

- P1: So, when we finish, we finished, we push here, done?
- P4: yeah we push here
- P2: Ok, this is like a...
- P3: I think maybe the screen, is not still ready.. err.. developed.
- P2: ah the screen?
- P3: yeah the screen
- P2: but it is ok, no?
- P3: yeah, more or less it is working... so now we have to create some groups, and put 112 the ideas we have in common in the same groups?
- P1: yep
- P3: ok
- P1: Ok, all of you are ready? Or I have to do another note?
- P3: for me it's ok
- P2: now add groups
- P1: yeah, now have a look at the other one
- P4: no we have to group one
- P3: but, I think before that we speak each other
- P1: yeah, based topic
- P3: yeah
- P1: ok
- P4: yes
- P2: but group one, no?
- P1: wait wait, before we have to see which..
- P4: yes but Carl is user one, so he can read all the notes that he write after me, you
- P1: yeah yeah
- P2: but we have to put the groups in different groups
- P3: create the group, group one.
- P2: G, r, one... I don't know
- P4: whoops
- P2: no, it's ok
- P3: we have group one. So ideas about the competitive in the sport, some one thing
- 135 that sport is very competitive.
- P2: yes, the sports world is changing... or no, it's not the smae.

- P1: let's read what we have written.. let's read
- P3: ok, sport and shows one of the most beautiful behaviours
- P1: ok
- P3: the world's sports is very competitive. Sometimes people is not fair and they do drugs
- P1: Ok
- P2: ok, umm, the threats of nowadays are matches, so I think the sport is morefocused on speculation. The win gold is the most important. A[nd the ass]ociative

P1:

- [win gold?]
- P4 (Beta): what is win gold?
- P2 (Lada): it's like you want only win the gold
- P3 (Carl): the gold medal. The Olympic kind
- P1 (Dim): [ah ah, ok ok]
- P3: [if you are the] first you win the gold medal
- P2: it's the objective. The win gold is the most important, and the sport people become heroes.
- P1: at it's story, it can show good values. The sports man is talk a lot of gossip about athletes. Some athletes behave badly.
- P4: which kind of sport will we meet in the future? Real past experience athletics.

Sports world is changing. New rules for controlling professional sport.

- P3: ok
- P1: ok
- P2: I think the athletes of nowadays are matching and yours..
- P3: and the world sports is very competitive
- P1: yeah
- P4: and the sports world is changing
- P2: and is the win gold the most [important], I think
- P3: [ok the first group]
- P1: yep
- P3: ok
- P4: and the sport world is changing, maybe no?
- P3: ok
- P1: my friend, come here
- P4: come on
- P3: it's ok. I think I have one in common with you. Sometimes people is not fair and they do drugs, so let's not behave badly.
- P1: yep
- P4: yes

- P1: goes where? here P3: here P2: no, well we can put now to the trash, because we don't have as a group P4: no no, you need to write P3: we have to write P2: I will write P3: no, no P4: no, it's ok P2: tomorrow we are going to better I think, this is the first [time], so.. P3: [true] P4: a sport can show some P3: no, no, sorry, so sorry, it's not, it's this... and do you have some topic that more or less means the same? P4: this sport news are more, I think P2: maybe this one, no? new route for contract professional sports P3: I think so P1: yep P2: no? P1: against bad behaviour P2: I think this no P3: no, it doesn't fit.. ok? P1: ok P3: I, I just have one more. It's like sport can show some of the most beautiful behaviours, but I think no-one has written this P1: no, I written that [some of them] have good values P2: [experience] P3: ah, this is the same P4: but here they don't draw. I don't know what happened P2: no I think they cant enter into a contract Me: how did it go? Is it good? P3: so P2: I don't know here? P3: you just have to create another group Me: you just need to be a bit faster
  - P1: yeah yeah yeah

- P3: just put magazine
- P4: I think this chewing one can go here
- P3: it's just we ca[n]
- P2: [may]be this one can go with this, which kind of sport will we meet in the future
- Me: when you are grouping try to see a specific option
- P2: no opinion
- Me: when you are grouping, try to see why they are shared, why they are sharing one, one thing. This would help you [to]
- P1: [no] four
- P4: we make two groups.. but then we umm
- Me: yeah that's good, you just touch this one
- P2: this also
- P3: yeah why not
- P2: the key here is not this
- P3: it fits better with the idea of Dim
- P1: yeah yeah it's true
- P3: ok
- P1: ok
- P3: so
- P1: group 5
- P3: I think
- P4: no
- P3: it doesn't fit
- P2: maybe the news and magazines can talk about real experience. I don't know. No?
- P1: should talk more about real experience. This magazine area
- P4: yes
- P2: yes this is like athletes. The competition
- P1: this is
- P2: behaviour. And the other one is associative
- P1: good uh?
- P4: yes it's ok but we need more sentences
- P1: ok, let's move on
- P2: no but no, I don't want it
- P4: no. it's ok
- P1: it's time to move on. done
- Me: you want to move, yeah? you should all decide, or you should give them permission

- P3: ok
- Me: By the way, before I forget, this will be done after we finish. So this will be, we put the vocabulary back to the spaces and this will be a summary. So try to get ready when you are working, try to get ready for this. This one for ten minutes and this one for ten minutes. So we will finish, we will really try to finish in ten minutes. So it will be against time.

P1: ok

- P4: and now
- P1: what will we talk about? Now we are just write.
- P2: but it's the same
- P4: no but
- P1: now yes. But what you think is going to speak
- P3: ah but a new document
- P1: no, [like the first piece was like a preview]
- P2: [yes it's going to be like 2 paragraphs], 1 paragraph and now there are going to be another paragraph, so we have to predi[ct]..
- P1: [wh]at is going to yes. The first one was like an introduction
- P3: introduction, yes, I think so.
- P2: I have problems with my computer
- P3: ok
- P2: a new note
- P3: ok
- P2: but we have to do like a question, and then. No.
- P1: no, just notes. Just notes.
- P3: yes
- P2: tramp?
- P1: tramp, t-r-a-m-p
- P2: tramp
- P4: now they didn't write
- P3: it's ok
- P4: I think this one is better. For example, this is a title, right?
- P3: the target
- P4: yes, the target in the picture, that is bigger than this one
- P3: maybe, I don't know. It's possible because there are people standing, not sitting
- P4: it's more comfortable like that. Ok?
- P3: it's ok
- P4: wait for me

- P3: ok. Click and clank
- P1: click and clank
- P2: section one.
- P1: witness? To witness is being err.. to see. In the crime the witness are who sees
- P3: if you see something committing the crime, you are the witness
- P1: ok. Truly?
- P3: truly is authentical. Truth. Really authentical
- P4: how I can take out this? Because I don't know how I did
- P3: what's happened?
- P4: to take out
- P3: oh, why have not sports?
- P4: I don't know, I think it's when you are moving, umm, go on down
- P1: it's very short this one. This one I finished
- P3: but I don't know, how can you write sports
- P1: why sports?
- P4: you can take out
- P2: no, this one no
- P1: just two times
- P4: yes, twice I think
- P2: no
- P4: it's possible that it's a little bit goer.. I don't know how I...?
- P3: do you know what's the meaning of display?
- P1: you need my, my finger.
- P4: yes
- P1: with what?
- P3: how how, how did you do?
- P1: like this.. I think is my finger special..
- P3: special finger, ok.
- P4: why a long? A long is not allow display
- P1: but is very short this one. I finish it
- P2: no but
- P1: what?
- P2: really?
- P4: yes but don't appear
- P1: but what? Done... what do you need?
- P4: not this one.

- P1: which one?
- P2: desi
- P4: no
- P1: which one?
- P4: no.. no.
- P1: yeah
- P2: and this one.. truly
- P4: but I cant go to truly. What happened with truly?
- P1: that's called engineering.
- P2: the screen is different, I think
- P1: tomorrow, tomorrow no-one will sit this chair
- P3: so I can just reach the end of section one
- P1: I've already you know, used done
- P3: but
- P2: finish here?
- P3: I can just reach the end of section one.. it finish here.. ah yes, paragraph one
- P2: so but my screen is
- P1: what do you need? To put that..
- P2: ok, it's enough, no?
- P4: yeah
- P3: you need to teach..
- P1: hm?
- P3: ok
- P1: use fix up strategies to understand the words
- P3: who has put us? who has put us?
- P4: me, no
- P2: me, no. it's possible that it appear, that when you, I don't know..
- P3: truly is like really
- P1: yep
- P4: really?
- P3: it is a fact that is true
- P2: truly is like from true
- P1: [yeah it's from t]rue
- P3: [yeah from true]
- P4: ah.. what is this?
- P1: that's a good one this one is a face, a display

- P3: display? P4: display? P1: display is like show P3: it's like show P1: yeah. Display you can see P2: at least show many of the classical categories P4: ok P3: so next P1: can the word be broken? Ah, why this one? It wasn't in our reading P3: no... no... and eh.. no.. no P1: again P2: [truly] P3: [truly]. In truth. Genuine idea P4: in truth P2: in truth P1: display P2: so display we know, no? P1: yeah P4: sure P1: ah ok so we can do also done P3: yeah maybe when we know the meaning of one word just we have to... to skip maybe? P1: hmm.. to skip here? P3: maybe, I dunno P1: or maybe to do done.. do done.. no now we have to do here.. you know if you could put on display.. aha.. again P4: display. show P3: let's others here know P4: courageous
  - P1: you know courageous?
  - P4: I don't know courageous
  - P3: courageous just when you are..
  - P1: you are not scared
  - P3: the opposite of scared
  - P1: yeah the opposite of scared
  - P3: you can face all difficult situations
  - P1: usually heroes are courageous

- P3: you are like a hero
- P2: ah, so, you have, for example. I have to go, I don't know
- P1: for instance, I say you Lila, come on in the cemetery during the night
- P2: I am going say yes because I am courageous?
- P1: yes, if you go there alone
- P2: yes, I am not afraid
- P1: after I have told you ten thousand stories about ghosts
- P3: you are not afraid... but something is to face up difficult situations in your life
- P1: yeah, yeah
- P4: but it's the same in Spanish I think
- P1: yes, in Italian it is the same... corage
- P4: yes
- P3: yeah it's the same
- P1: let's try this strategy done
- P3: done
- P2: ah done
- P2: us [done]
- P4: [done]
- P3: desire
- P1: when you wish
- P3: yeah, when you wish something
- P2: yes it's
- P3: thrilling
- P2: thrilling
- P4: thrilling
- P3: a feeling.. very exciting.. maybe for, the film was very thrilling
- P2: thrilling is like thriller, I think it's going to be like
- P3: yes, thrilling is the same... when something is, take your emotions, the match was very thrilling because it was a great match, an exciting match, maybe they drew four, four, so it was a thrilling match, you cant watch the final result
- P1: ok ok ok, I got it
- P4: ok
- P2: and now?
- P3: and now the next section
- P1: get the gist, yeah, get the gist. We have to read.. and err
- P3: and after that?

- P1: write some notes.. yeah, get the gist, the main meaning.. get the gist
- P4: no no no, we cant remember
- P3: write the main idea from the paragraph, so you have to summarise the paragraph
- P2: yeah, the main ideas

P3: in some sentence

P4: oh

- P2: it's the same as before?
- P3: no, before we wrote our previous idea
- P2: yes but
- P3: about the sport... now we have to summarise
- P1: you have to write but change what we have talked about our reading.. writing
- P2: ah, first from the paragraph one
- P4: ok.. and the errors?

- P1: ok
- P2: I do a lot of.. oh my god..
- Me: are you saying something?
- P1: I accept
- Me: you're grouping, right?
- P1: yeah.. she made a lot of notes [without]
- Me: [ah, ok]
- P1: without writing the [notes]
- P4: [how] many?
- P3: because when you trying to move, you know.. now.. ok
- P2: and now this
- Me: don't worry about that, it's ok
- P2: sorry
- Me: you have lots of notes, it's ok

P1: I think that uh, for instance, it can be a problem in English, because there are, for instance when you say marks out, you see it's important grammatically. You can write but without apostrophe, grammatically it can be.

- Me: yes. I talk to the computer science people
- P1: yeah, I just saying you because improve it. Just for this
- Me: I couldn't fix it actually, because it's very, it's a bit complicated you know. We'll try to solve it
- P2: but here, we only have to write the meanings of paragraph one
- Me: no I'm sorry, this is section one. This is a mistake.

- P2: only the paragraph one
- Me: this should be section one, this is paragraph
- P1: but we have to write the main ideas from just this one, or from all we ever read?
- Me: no no for this part only
- P1: just for this one?
- Me: yeah for this part. It has paragraph one and I think paragraph two. Yeah, it has two paragraphs. Now, you have to move a little bit faster. Time is running really fast.
- P2: I can put
- Me: I've already finished, so
- P2: I don't know because I don't read all.. I thought it only the paragraph one. So.
- P3: ok, so for me it's done
- P1: ahh, you want to stall huh?
- P4: I am thinking.. but don't worry, we can do it like that
- P2: only you
- P3: it's ok
- P1: ok
- P4: ok don't worry, it's enough

- P1: don't you mind. Done?
- P2: done
- P3: ok
- P2: paragraph two
- P1: click clank. Mmm. Click clank
- P3: click clank. Yes we have to... yes
- P1: no
- P4: why up here?
- P3: because do you know the meaning of consciousness? And self..
- P1: like conscious
- P3: yeah but consciousness is the name, like
- P2: but here we have to do
- P3: yes.. but selflessness?
- P4: I don't know this
- P1: yeah me neither
- P4: yes me too
- P1: me neither, me neither. No. you're to push on the top of the words to get the box

- P4: what?
- P1: you have to push on the top of the words like this
- P2: no, more in the top.. no, it's more here.. my screen is a little bit moving
- P3: no but all the screen, you have to touch maybe at the top
- P1: the heart of the word

P2: ok

- P3: it's ok. No but no
- P2: moreover?
- P1: moreover is like also but more
- P3: an aggregate
- P2: yes but here we have to do and then in the other one we have to speak and explain to the other one
- P3: no we can explain if some one of us know the meaning, we explain to the other but if no-one knows the meaning, we use... have you finished or not?
- P4: no
- P3: no no it's ok, you have to wait for Beta
- P2: no because I am there
- P4: ok
- P1: selflessness
- P3: selflessness the next topic
- P1: [yes]
- P2: [yes]
- P3: the qualities... social.. no because for the context
- P2: no, you can't understand we have to consider
- P3: I'm not able to.. our next topic..
- P2: so we are in the same case
- Me: if you feel that you need a break, just let me know
- P3: but there is like a, I think its not, ah..
- P1: this one is show up
- P3: always show the same word, you know
- Me: no, this one is an example. It's kind of a model for you to work on and follow
- P4: ah
- P1: ok
- P3: ok.. ok.. not selfish
- P4: ah, not selfish

- Me: if you need break just let me know. Anytime you need a break just let me know. We usually have a break after section one
- P4: ah ok
- P2: or we can finish now. This part because we are in the middle of the test... not selfish ok
- P1: selflessness is like unselfishness
- P3: like selfness is like selfish, it's the maybe
- P1: or unselfishness is the opposite? Are the same this and this or not?
- P2: yes
- P3: yes because less is like un
- P1: oh, yeah yeah yeah
- P4: what does selfish mean?
- P2: selfish is when you want to do something and you have to do. No, you are going to do if..
- P3: selfish is when you don't take care about the other people
- P4: ok. You're only for your life
- P3: you don't mind other people
- P2: you want only this gold, so you are going to do all the things
- P1: no no, can you explain me, selfish, what does it mean?
- P3: you don't take care of other people. It's a bad word in the bad sense. You don't care about another people because you are interested in yourself not another thing
- P1: but if I'm selflessness, I take care about the other one
- P2: yes
- P3: you are caring. If you are selflessness, you are caring
- P2: you are like generous. It's similar to generous
- P3: caring
- P4: opposite
- P1: selflessness I take about other people
- P4: selflessness is opposite of selfish. Ok
- P1: ok
- P4: which one
- P3: next, reinforce.. it's like remark. do you know?
- P4: no
- P3: do something stronger
- P2: ah, it's like force
- P1: yes force but reinforce.. again
- P3: reinforce is again
- P4: ok

- P2: it's like remark
- P1: yeah
- P2: this
- P1: hold on
- P3: self observation. Do you know the meaning?
- P4: no
- P3: I think it means when you are very focused very concentrate on getting something
- P1: yeah. Just quickly
- P4: to win a competition for example, no? you only think about this
- P3: engage, maybe engage is the word
- P2: ok, yes
- P1: consciousness. Yeah I think it's like you know what is conscious
- P2: it's impossible to pronounce this
- P4: consciousness. It's the same but consciousness is the opposite
- P3: no this is a prefix, a suffix, conscious is an additive, to build or make.
- P2: to become a noun
- P1: knowing and being aware of what is around him
- P4: yes. It's the same as in Spanish and Italy I think
- P1: yeah
- P2: physical.. I don't know
- P4: I'm sorry
- P3: ok, mainly
- P1: main
- P3: the more important
- P1: yeah
- P2: the mainly idea
- P4: yes
- P3: skills
- P2: you have, like
- P3: your qualities
- P2: your qualities, ok
- P4: qualities, abilities. Ok
- P1: yeah. Medical skills for example
- P2: for example you are studying business or you are
- P3: proven your skills in business if you study business
- P1: ok

- Me: if you need a break, you can take a break. Stretch your legs, you back
- P2: yeah
- Me: I will save the file
- P2: Write how many ideas for a paragraph?
- P4: three
- P3: two
- P2: two
- P4: two? No, section two, paragraph three
- P1: yeah, sorry.. no, but this we have done
- P2: no but write the main ideas from the paragraph
- P4: I think section two because there was like a mistake
- P1: but I think we have written the main ideas
- P2: no, the first one
- P3: ok. Should I write the main ideas of section two?
- P4: it's here
- P1: what? I remember we did this because I written some notes about this one. Ah, maybe no... ok.
- P2: I'm sorry
- P3: you are being recording
- P2: eh?
- P3: you are being recording, be careful
- P2: yes, because of that I say to you
- P1: ok, c'mon
- P3: so guys
- P4: what?
- P1: this time we don't need your permission
- P3: ok, right first thing, about the document, ok
- P1: what?
- P3: but I think you... you had your permission activate. This was the problem.
- P4: I dunno. Sometimes I dunno
- P3: now you have activate
- P4: why?
- P1: because you touched.
- P3: not done
- P1: you touched... So we can move on without your permission again
- Me: so you missed the grouping, right?

- P1: no, create one question per note... this in theory should be the summary
- Me: this is, remember I told you that this is the last session? So it brings you everything that you have done
- P1: yeah but, I think we have done.. yes, more than this?
- Me: you have done brainstorming?
- P1: and how can I... can I get the other things?
- Me: have you also done prediction moving?
- P2: yes I am right in there
- P1: what?
- Me: yeah you need to touch yours first
- P1: but it's too big, how can write it?
- Me: no this is a reading thing, couldn't uh.. you don't need to write anything here. You write in your notes. This gives you information from what you have already done
- P2: yes but I was
- Me: no no you should actually touch there and start writing. But if you didn't...
- P2: yes but this disappear
- Me: try to write again. Go ahead. Yeah. You always need to touch here first, and then write. You touch yours. But it seems that you missed some grouping. We did only one grouping, only brainstorming right?
- P3: yeah
- Me: you didn't do grouping for prediction?
- P3: just for brainstorming
- Me: only for brainstorming?
- P3: yeah
- P1: for prediction [we didn't do group]
- P2: [yes we wrote]
- P3: [we, we], we did another
- Me: really?
- P2: yes
- Me: because supposed to have them somewhere.
- P1: no maybe we didn't do for prediction
- P3: I think that just we did one
- Me: just for brainstorming?
- P4: for prediction, once only
- Me: because it has to be done actually for brainstorming, for prediction..
- P2: ah no but group, no?

Me: yeah

P3: ah yes we didn't do grouping

P2: no

Me: for prediction and for reading, for section one for reading. Which is get the gist. And section two, for get the gist... So I think you should be four of this type.

P4: no

P3: no

- P1: no, we did just one
- Me: ok this is my mistake I should have actually explained that. Anyway, don't worry about that, maybe this would help. Yeah go again, try to make a question and answer, and do grouping like this. After you finish, you will do, when you touch these, you will come to grouping, but always remove this so you will see it in the middle.
- P1: but for instance, to do grouping after we write the year should appear?
- Me: after you finish writing the notes, you click done, done, done, done. So you will see after this.. Hi ....
- P2: in the others, they don't appear a group?
- Me: no this is the first one, forget about that. This will help you to give you some ideas to current questions
- P1: ok ok ok ok.
- P4: ok
- Me: you have let's say, maybe 10 more minutes, will that be enough?
- P1: ok
- P4: can we write the answer or only the questions?
- P2: and the answer, question and answer in the same
- P4: yes
- P4: how do you make?
- P3: what?
- P4: nothing
- P1: it's like writing a diary... and err things
- Me: but we're testing the grouping... are you done the, with writing notes?
- P1: yeah
- P4: I am, but time is done
- Me: you have some time
- P1: no but look... Now we have to group
- Me: yeah this one. This is what you've missed actually.. but that's fine, I will work that out...
- P3: my first question is...
- Me: that's question two
- P2: I want to put the first but I..
- Me: it's ok this will help you to
- P4: it's ok
- Me: so you are done from this? Done from all sides?
- P1: no but if you do done we have to move on.
- Me: oh wait
- P1 so no done.
- Me: yes yes
- P2: so group one
- P1: Carl, let's start reading
- P3: ok, do we have the correct conception of athletes. And are really interested in how the athletes get they achievements
- P1: do you have four?
- P3: this is my question... do we have the correction conception of athletes. And are really interested in how the athletes get they achievements
- P1: ok
- P4: nowadays it's difficult to be a leader. Yes for the reason the letters are more competitive. All the letters use drugs, I think the that the society in general put in the in the same pack all the letters but only few them use it.
- P1: actually I forgot to write the answer. I wrote just the question mark
- P3: just the question
- P1: what kind of failures drive a person to became a good athlete? Are values society influencing by sport values? Can athletes do whatever they want without society doing anything to stop bad behaviours?
- P2: who have became the athletes heroes? I think they are the news who change our minds. Are the sport influence on news and society? I think it is an economic decision because the sporting athletes are heroes
- P3: I think these questions are related
- P2: yes
- P1: this one and also this one about society
- P3: you have the..
- P1: and are values society... and also this, what kind of values. no
- P2: I think this also
- P1: no it's not
- P3: to have the correct

- P4: influence about news and society, I think it's all there
- P3: no but maybe this is the second group. Are we interested in how the athletes get their achievements. I think, no maybe.. this one about the news and society
- P2: and this one use drugs
- P3: ok maybe we have
- P4: and another group
- P2: yes
- P3: yeah
- P2: yup
- P1: yeah this one, what kind of values that a person can...
- P4: maybe this?
- P1: can athletes do whatever they want without society's..
- P2: yes I think
- P3: it's possible.. umm what about this?
- P4: nowadays it's difficult to be a leader yet result... are more competitive. Maybe no, yes
- P1: it's ok
- P2: ok so now?
- P3: now we are finish
- P2: yes done
- P1: done
- P3: finish
- P4: ok let's go
- Me: thank you very much

## Appendix 10: Transcription of group interview questions and answers

Key:

- ME: RESEARCHER
- P1: Participant 1 (female)
- P2: Participant 2 (male)
- P3: Participant 3 (male)
- P4: Participant 4 (female)

Questions:

Students' perceptions about their experience with reading on the tabletop computer
<ol> <li>What reading methods (ways of reading) were you taught before?</li> </ol>
2. How did you use to read?
3. What did you think of the reading programme in comparison with other reading
methods you were taught?
4. Did the reading programme change the way you read? Would you explain further?
5. Do you think that the reading programme had an impact on your reading
comprehension? In what ways?
6. What were the most helpful parts of the reading programme? In what ways?
<ol><li>What were the least helpful parts of the reading programme? In what ways?</li></ol>
8. Are there any features you would like to see in the reading programme that you did not see? What are they?
9. How helpful were the FIX-UP strategies?
10. Which of the five FIX-UP strategies were the most helpful? Why?
11. Which of the five FIX-UP strategies were the least helpful? Why?
12. Do you have any suggestions with regard to FIX-UP strategies?
13. Do you think that the reading programme had an impact on your English learning in general? In what ways?
14. If you were in charge, what would you do to make the reading programme better?
15. What do you do when the text becomes difficult while reading on the tabletop computer?
16. How helpful was the <b>group discussion</b> ? Would you explain further?
17. How did you help one another to understand the reading text?
18. How did you help one another to overcome difficulties such as unknown vocabulary or unclear and difficult ideas?
19. Would you recommend the reading programme for your school? Why or why not?
20. What do you think of the tabletop computer?
21. What did you like best about the tabletop computer?
22. What you didn't like very much about the tabletop computer?
23. Are there any features you would like to see in the tabletop computer that you did
not see? What are they?
24. Would you recommend the tabletop computer for your school? Why or why not?
25. Do you have any comments you want to add about the reading programme, the
tabletop, the reading strategies, etc.?

- 1 Me: Alright, so as I mentioned, the main reason for this discussion... focus group. Is to get
- 2 you know, your own ideas about, you know, your previous experience about reading... Your
- 3 experience of the, experience of the Tabletop. In those days that we have gone through, we
- 4 have taken 5 topics about reading; different readings, different texts.
- 5 So, if we start with the first one, this one talks about your previous experience. So 'what
- 6 reading methods', means 'ways of reading' were you taught before? So we will start for
- 7 example, we will talk one by one, ok. And then, while somebody's talking, if someone has a
- 8 different idea, he will just, raise his hands, and then mention that. Because in the recording we
- 9 need to have everything clear, we don't want like, 2 to talk at the same time, because this will
- 10 be difficult for me to transcribe ... alright... Thank you so much. So, ...... would you like
- 11 to start?
- 12 P1: Yes
- 13 Me: What reading methods were you taught before? Like, let's say in your current,
- 14 International House School.
- 15 P1: Yes, my idea is that difficult method of 'the paper'. Um, I take the more important things
- 16 for example... But, like this method, I've never used this one
- 17 Me: So what was the past one? You said paper, what do you mean by 'paper'?
- 18 P1: Read the text
- 19 Me: you read the text, yes..
- 20 P1: Umm, more important things
- 21 Me: Ok.. What, there are questions that ask you about the most important things?
- 22 P1: No. First of all, read all the text. After, read the questions, and then try to find solution in
- the text.
- 24 Me: So, you were taught this way the teacher asking you to read the text, then go to the
- 25 comprehension questions, right? Is that what you mean?
- 26 P1: Yes.
- 27 Me: Right, number 3.
- 28 P2: Yeah, it is this method. You start, the teacher asks you to start reading. After that, asks
- 29 you to read faster, fast. And while you finish reading, there are some kind of questions like
- 30 true/false, to check if you have understood the text that you have read.
- 31 Me: of course this is in the same class, at the same time?
- 32 P2: Yes. Also, maybe you ask about some vocabulary that you don't know, or before you
- 33 check the vocabulary, and after ask the teacher about some vocabularies, and usually after the
- 34 reading there are some activities, it can be true/false question; it can be match the paragraph
- 35 with the title or some key words; or it can be questions about the article, that you need to
- answer; it can be fill in the gaps.
- 37 Me: Ok, thank you.
- 38 P3: Yes, I think that the method is basically this, even, I think it's the same for first certificate,
- 39 for advanced certificate. You have to read quickly, then go to the question, and try to indicate
- 40 the last word into the test, and sometimes, because it's an exam, you are just looking for the
- 41 last word, not more. But when you are in the lessons, then there are other activities; we talk
- 42 about the more important words I think in the text.
- 43 Me: Ok, so this is all written, right? But there is no discussion, there is no discussion, you
- 44 don't discuss with the reading.
- 45 P3: Well, sometimes we discuss just in pairs to know about the topic of the reading... talk
- 46 with your partner about the topic and situation, who has similar, which was similar in your
- 47 life, or experience with this topic that you have. Some things like this.
- 48 Me: Is there any way, when you discuss with another person, when you discuss with your
- 49 peers, do you usually follow a specific way?
- 50 P2: Can you repeat the question please?

- 51 Me: Do you follow a specific way for discussion? I mean, does the teacher ask you when you
- 52 are discussing, well you should do this and this first?
- 53 P2: You have to do the exercise individually for 1 minute.
- 54 Me: What do you mean by 'exercise'? The reading itself?
- 55 P2: No, the exercise related to the reading. Like the true/false about the reading. You do the
- 56 reading, after you do the exercise about the reading, it can be true/false question, individually.
- 57 And then the teacher asks you to compare the answers with your partner.
- 58 P4: Sometimes you have the same answer, so you are ok, and sometimes we have a different
- answer, so we try to explain why you put this answer.
- 60 Me: Hmm, but there is no discussion of the reading itself?
- 61 P4: No. it's only for a particular..
- 62 P1: Sometimes we make some fast reading, individually. Then after in pairs, then try to
- explain what meaning, or what you understand about the text. And after you read all the text,and answer the questions
- 65 P3: But sometimes I have done a discussion about the text, I think usually before to read the
- test, a discussion about the topic, then read the text, then answer the questions, match the
- 67 paragraph task maybe, vocabulary..
- 68 P4: But not like one paragraph and you discuss this paragraph.. it's not like here that you are
- 69 discuss about a general text but also one paragraph, and this about this paragraph, because we 70 are like discussion..
- 71 Me: So you mean, you don't take it paragraph by paragraph?
- 72 P4: No
- 73 Me: You take the whole text?
- 74 P4: Yes
- 75 Me: and you read it, and then.. what do you do, do you have the same experience?
- 76 P4: Yes, but I have, when you do the reading, all the teachers told us you have to read
- quickly, then read the question but you don't have to read the answers, if it's multiple choice
- for example, it's: a, b, c.. you don't have to read the answer, you have to first thought what is
- the answer in the text, and then go and read the multiple choice.
- 80 Me: I see. So ok, that's the way you were taught how to read. So, personally for you, how do
- you think you usually read? I mean your habit in reading. How did you read? For example,
- 82 how did you used to read? Your habit. When you come to a text for example and you are at
- 83 home or in school, you are not in class for example. Or maybe inside the class and you are
- 84 given a text. What is your habit, what is your used to read?
- 85 P4: I read the text?
- 86 Me: Do you have a specific habit for reading?
- 87 P4: No. now yes because the teacher..
- 88 Me: No, in the past
- 89 P4: In the past? No, no. I read the text and trying to answer the questions.
- 90 Me: Yeah, that's the way you read. So, when you, how you read the text itself?
- 91 P4: Yes
- 92 Me: You go just immediately to the text and read it. How do you read it?
- 93 P4: Trying to understand on the text.
- 94 Me: Your own experience about yourself?
- 95 P4: Yes, yes, I read the text trying to understand... And answer the questions... I don't have a
- 96 specific for me.
- 97 Me: You don't have a specific method?
- P4: No. Now yes because the teacher explain or taught which is the best for reading. But in
- 99 the past, no.

- 100 Me: Right, so before that, and then were there other ways? You just follow what the teacher
- 101 tells you to do?
- 102 P4: Yes
- 103 Me: You read the text and you go to comprehension, right. Dim do you have a specific
- 104 experience about yourself how you used to read?
- 105 P2: When I reading class for the teacher?
- 106 Me: For your own...
- 107 P2: I usually underline the words that I don't know in order to look for them afterwards in the
- 108 dictionary or ask to the teacher. And I, it's like this, I read to, up the dot, I read up the dot,
- 109 until the end of the text. To check if I understood. Like, you say until the dot, no? when there 110 is like a paragraph?
- 111 Me: Ok, so you like to read in parts?
- 112 P2: Yes, I mean.. for instance, I read up the paragraph, and if there is some words that I don't
- 113 know.. in class I just underline it and after I ask or check.. when I read in my home, for
- 114 instance, anything in my home, like a book or website, article newspaper, in my home.. I am
- used to reading up the, until the paragraph, and after look for some words I don't know..
- 116 Me: You mean look for them in the dictionary?
- 117 P2: Yeah, if they are important to understand the meaning of the paragraph. Otherwise, if they
- are not very important, sometimes I skip to.. if I understood the overall meaning of the
- 119 paragraph I don't look for the words, just go ahead, especially when I read a book, because..
- 120 Me: yeah, it will be faster
- 121 P1: you can spend one year to read a book
- 122 Me: Carl?
- 123 P3: For me it was like a disaster because I try to translate every word, so I start to read and it's
- 124 annoying me, really annoy me.. because it was impossible, if you try to translate every word,
- so now I have learnt that maybe in another language you just have to understand the main
- 126 sense of the paragraph and continue. Just this.
- 127 Me: Yeah.
- 128 P4: For me, I usually I read all the text, but if it's one page, I usually read all. But for example
- 129 our teacher told us that you have to read quickly; and the first sentence and the last of the
- 130 paragraph; and then the second paragraph. For me, I don't like this. I don't have any sense
- 131 because I don't understand nothing about the text. I need read quickly but I need read all. I am
- 132 not going to understand something, some words, but I need read all because I can lose the
- 133 feel, no, the main plot of the text.
- 134 Me: I see, what do you do after that? When you read quickly the whole text.
- 135 P4: When I read, then if I have to multiple choice exercise, I start reading question, and then I
- answer.. and if have any vocabulary, I underline.
- 137 Me: so you underline when you have vocabulary?
- 138 P4: Yes
- 139 Me: ok, that's why, after you read you go back to the vocabulary?
- 140 P4: after read I go to vocabulary
- 141 Me: you underline them?
- 142 P4: yes
- 143 Me: ok, do you look them up in a dictionary? Or just go back to the comprehension
- 144 questions?
- 145 P4: it depends on if there are a lot of vocabulary in one sentence and it's the main important,
- the main sentence in this question, I need go to the dictionary first. But sometimes you can
- 147 understand the context of the text, without one word or two words.
- 148 Me: so for this dictionary, do you usually carry it with you? Or are you provided with a
- 149 dictionary in class?

- 150 P2: I use the one in class, English-English, and I also have the mini-Italian-English dictionary,
- but it's the mini one, the little one. It's a book but it's little, not big.
- 152 P4: At home I used the internet, the oxford dictionary. I use the dictionary English-English,
- 153 typical dictionary.
- 154 Me: The typical one, the book. Oxford?
- 155 P4: Yes. And I use the website.
- 156 P2: Yeah, I use 8, Oxford 8 or something, and WordReference.
- 157 P5: And Lingua, that they translate text, the whole text.
- 158 Me: Ok, once more to the next point, it says: what did you think of the reading programme in
- 159 comparison to other reading methods you were taught? So now we just want your idea, what
- do you think of this reading programme in comparison with other reading methods that you
- 161 were taught? So shall I start with you?
- 162 P1: I think that it's other method to do the reading, one more. But it's ok I think, because you
- 163 go step by step, and read paragraph for paragraph. So I think that it's good because it's easy to 164 understand the text.
- 165 Me: Ok
- 166 P1: But I think there is one part that for me I don't like it. It's the part when you check, when
- 167 you don't know the word. Click and Clank? I don't like it because I think that, for example,
- 168 when we don't know one word, we pass all the steps very fast. For example, if someone,
- 169 student, I don't know what the meaning of students, we pass all the screens very fast. Because
- 170 first of one, say students what is the sentence is this this word that you don't understand. The
- screen was very fast. After say "I'm happy" for example, you put the perfect tense, this screen
- 172 I never use. I think that the screen that is better for this step is the last one. The definition.
- 173 Me: So why you don't like it?
- 174 P1: I don't like it, the other screens.
- 175 Me: You don't like those?
- 176 P1: Only the screen that puts the meaning of this word. Because the other screens I never use.
- 177 Me: So, if you compare.. let's kind of, let's just make a comparison.. what do you think of the
- 178 reading programme when you compare it to other reading programmes, other readings you
- 179 were taught?
- 180 P1: I think that it's other method. It's ok
- 181 Me: So you think it takes like a, you said paragraph by paragraph
- 182 P1: yeah this is ok, I think it is a good idea.
- 183 Me: but you didn't like the part about..
- 184 P1: I don't like this part because here I've never used this part.
- 185 Me: ok, are there any other things?
- 186 P2: I think that this one, this method with the Tabletop, there is more co-operation. I think that
- 187 you have to make groups, you write notes and after make groups. Through making groups
- 188 you can share your ideas, and also you can.
- 189 Me: For collaboration? You think there is a chance for collaboration?
- 190 P2: Yeah
- 191 Me: Compared to.. so in the previous one you think there is no collaboration?
- 192 P2: I think it is maybe less collaborative
- 193 Me: because you mention peer, and peer-to-peer discussion. Do you think collaboration
- 194 would be ok when you compare it to this?
- 195 P2: I think that this is more collaborative.
- 196 Me: this is more?
- 197 P2: because in that one, you speak just with your partner about the exercise. Here you write
- notes and you have to do group after.. so this implied you have first of all listening, listen all

- 199 the other ideas, and after you have to think how they are linked to each other. So you have to
- 200 do this kind of work, link different ideas
- 201 Me: So you think for writing notes it is helpful? In what way do you think it is helpful?
- 202 P2: I think that it is helpful
- 203 Me: When you wrote notes, what did that help you in?
- 204 P2: First of all, when you write notes, you think, and also as, when you make groups, it is

205 good because you have to listen and see other ideas, and also you have to find the link that 206 there is between different ideas.

- Me: Anyone of you has an idea, and would like to say something about this collaboration. Do you agree or disagree? I mean it's up to you, you don't need to agree with what he says, that's his own idea. So do you think collaboration is more here?
- 210 P4: I think it is like, you are reading something, and when you are at the school you read
- something and you read by yourself. And you discuss all about the whole text. But here is like
- 212 more specific, you are discussing all the paragraphs. So in one text, you can use listening a
- 213 little bit because you are speaking with your classmates... You are writing, if someone then
- corrected the notes that you wrote, it is like you are practicing the writing; the speaking if
- 215 your teacher is listening you; and also reading, and comprehension of the text
- 216 Me: Ok, so you think there is a chance for writing, or there is a chance for practicing writing?
- 217 P4: Yes. For me, it's not only reading. If someone corrects all the notes after the class, it's
- 218 like you are practicing the writing.
- 219 P2: And also I think, that every time you write, you have to think, and you have to go deeply
- 220 like when you read. So this is a way that make you think about the text.
- 221 P4: yes and after one paragraph if you write... in one paragraph, the first paragraph you read,
- and then you have to.. so you have to, sometimes you can use the vocabulary that you are understanding in this paragraph.
- Me: you mean, when you are writing, you use the vocabulary that you read in the paragraph,
- in writing?
- 226 P4: Yes
- 227 Me: How do you think that is helpful?
- P4: For me, yes, because I study some words I don't know, I study, if you do or you speak or do a sentences with this vocabulary, in terms of writing, I don't know, you use..
- 230 P2: you will keep in mind.. it's easier to remember, to keep in the mind
- P3: I think it's a good point of the method that you generalise every paragraph separately, but
- there is a thing that sometimes you finish.. but I think the bad point of this is the thing that to
- do this properly is a clock.. just a time for to do every task. Because sometimes you stay, you
- become absent minded or think of other things because you have finished and other people are
- still working.. maybe it's there a time to do every task.
- 236 Me: So you suggest having a timer?
- 237 P3: Yeah, timer because this way you force people to work in this time, and be concrete.
- 238 P1: But I disagree with him because you have a clock, it's a more pressure
- 239 P2: You are under pressure
- 240 Me: Did you feel like you had enough time?
- 241 P1: Sometimes, it depends on the text, if you understand better or no. but if you have a clock
- only 5 minutes for to answer this question, and this part for you is more difficult, maybe you
- 243 write something for the write..
- 244 Me: I see.
- 245 P2: But I think that this is good. What did you say is a really good point about this method
- because the thing that you have to write, note, or also the thing that you have to write question
- and answer at end of the day, push you to think about the text, push you to reach a good
- understanding about the text. Because every time you write, it's like, that you think what you

- read here, work in your mind.. I don't know how you say in English. Because every time you
- 250 write, you do what you read in your own words, when you do a writing, it's a process, and
- this process require that you think. So I think that this is a good point of this method, the fact
- that you write note, you write question, because it oblige you to think and to have a good
- knowledge, a good understanding about the reading. While sometimes you just read, just do
- the exercise, just say this is this, but you don't try to understand the text, the overall, the main ideas.
- 256 Me: So for, I mean, like there is no time, so for example, you finish early. Do you think the
- 257 Tabletop could help you doing something whilst you are waiting for others, friends to finish?
- 258 Could you suggest something?
- 259 P3: Because if you have like a clock, you are forced to work, you are more involved.
- 260 Me: I mean, for you, if you are done, and there is no timer.. but there is a timer
- 261 P3: but there is a timer, but enough time not a short time
- Me: So if there is no timer, and your friends are still working, and you are done on that stage;
- 263 do you suggest the Tabletop could offer you something?
- P3: maybe it would be a good idea, offer maybe working with the vocabulary you that youhave select, to build sentence with this vocabulary or things like this..
- 266 Me: Do you think the Table is helping you with that? I mean, in it's current form, do you
- think it is helpful now? If you are done, do you think it could help you to do something else
- 268 whilst you are waiting.
- 269 P4: While you are waiting, no.
- 270 P1: No.
- 271 P2: No. Just playing. Just playing with your fingers.
- P3: Whilst you are waiting, the vocabulary of the words you don't know the meaning, they
- 273 can show maybe in different sentence to show the application of the word. Because
- sometimes we use the word in the incorrect way. So maybe this is a point, something to do,while you are waiting for..
- 276 P1: but how long did you wait for example? 1 minute?
- 277 P3: sometimes 2 minutes
- 278 P1: in 2 minutes..
- 279 Me: maybe 2 minutes maximum
- 280 P1: it's difficult to make exercise for 2 minutes that you stay waiting
- 281 Me: it wasn't like a long time waiting
- 282 P1: no
- 283 P3: no
- 284 Me: So do you agree with Carl about the timer.
- 285 P4: he is a higher level than us
- 286 P1: maybe
- 287 P2: this night there is the football match, this is the problem
- 288 P1: I was under pressure the Barcelona is playing, Barcelona is playing..
- 289 P3: this is not the point.
- 290 Me: So, maybe we can move onto the next point. So, do you think this reading programme
- change the way you read? Do you think this reading programme change the way you read? I
- mean, now if you go back for example to your school, and they give you a text, do you think
- this programme changing the way you look at this text?
- 294 P3: definitely
- 295 P4: Maybe some parts
- 296 Me: Which parts?
- 297 P4: For example, read the paragraph for paragraph separate. And trying to understand
- 298 paragraph. Mark the words that I don't know what's meaning. Maybe this part is.

- 299 Me: Ok, can you elaborate a bit more?
- 300 P4: no, the other parts is the same
- 301 P2: actually, I don't know because I think that we have used this method just for a short
- 302 period. So I don't know if it's changed my way. But as I already said, the thing that you write
- 303 notes, the thing that you write the main ideas, the thing that you do write question and answer

about the text, if you use this method always, and you do reading with this method, maybe

305 can drive people to, when they read, to try to understand just the main idea. Just to asking

306 questions to themselves, to understand if they have understood, just to be more focusing to get

- 307 the main ideas when they read, and to exercise these skills, to get the main ideas maybe.
- 308 Me: So you would change?
- 309 P2: yeah. Maybe yes but I mean, it's just 5 sections. Maybe if I have done this at school for 5
- 310 years, or 2 years, you would have impact on me, but..
- 311 Me: I see, Carl?
- 312 P3: Yeah, I think I will change my way. For the accents, I will use the method of International
- House, it's very quickly, but in fact, last Thursday I was reading a magazine, just after 1
- 314 session, and I tried to do the method just read a paragraph and keep in my mind main 315 sentence.
- 316 Me: So you tried to use this strategy with reading?
- 317 P3: yeah, I tried. But I didn't have a dictionary
- 318 Me: did it help you? Did you find it helpful?
- 319 P3: yes because ok, you can understand the meaning, more or less the meaning of the
- 320 paragraph. You can continue, and some paragraphs are very easy because the vocabularies
- 321 easy, another paragraphs are difficult but you are able to understand maybe one sentence. But
- 322 you can match all paragraphs, it's ok
- 323 Me: Lada
- 324 P4: for me its useful but..
- 325 Me: did it change? I mean, did it happen that you came to read and found yourself using this?
- 326 If not it's ok
- 327 P4: no. in these 5 days, no, I didn't change
- 328 Me: Ok so we'll move to the next one. Do you think that this reading programme had an
- impact on your reading comprehension? Do you think it had an impact, an affect on your
- 330 reading comprehension?
- 331 P3: just these 5 lessons?
- 332 P4: in these 5 lessons, I think
- 333 Me: this reading programme, I mean for reading comprehension, the text that you were
- reading, do you think this programme has an impact and affect on your reading
- 335 comprehension?
- 336 P2: Yes
- 337 P1: Yes
- 338 P4: For me, when I read the whole text in the first step, I understand the many ideas of all the
- text, but it's like a quickly reading. But then after that, after read the first paragraph and wrote
- 340 the main ideas of the paragraph, I understand more of this text. And finally when I read the
- 341 summary, I know what I read, yes, what I read.
- 342 Me: you mean it helps you to remember what you were reading? Is that what you mean?
- 343 P4: yes.
- 344 Me: Ok
- 345 P3: this method is good to remind because you are, we can say, you are insisting on the same
- 346 paragraph once, and twice and three times. So in the end, you are able to remind a lot of
- things, and understand more things than in the first time.

- 348 P2: Yeah, and I think the fact that you divided in different sections, in each one you do the
- 349 work of [unclear] and writing and so on, and after at the end you do like, the last like writing,
- 350 is good the fact that it is divided. But I think as I said already, different several times, one of
- the most useful thing for me in my opinion of this method is that you write, and when you
- write you think. Because sometimes you read but you are lazy and just read and just get the
- 353 idea. But when you write, you are obliged to think and like not your whole idea, but to re-354 write the idea that you read from the text. So it's a process that you do in your mind, and you
- have to force your mind to understand the text, to write because before write you have to
- understand, it's the step behind writing is understand it, so force you to focus on the text and
- to rewrite the same thing in different word, in your own word. I think this is one of the main
- 358 useful things of this method.
- 359 Me: So I can see that you all maybe agree that it helps the memory, it helps you remember.
- Right? With the content, is that what you mean? It gives you a chance to remember, because it repeats a few things. You agree with me? Is that what you mean for example, and you found
- that the writing is helpful because it gives you another chance to write again, the ideas. You all agree on this?
- 364 P1: yes
- 365 P4: Yes
- JOJ
   P4: Yes

   266
   Max an land
- 366 Me: so look at this one.. so what were the most.. so now we need to be more focused.. you
- need to focus more on the programme itself, if you want to look at ti again, it's up to you.. so what were the most helpful parts of the reading programme and in what ways? What were the
- 369 most helpful parts of the reading programme?
- P1: The parts that is for reading 2 or 3 times. For example the first time you need to say or
- write the main important information that you read. And after you need to read again.
- 372 Me: which part is that? I mean, the most important, the most useful..
- 373 P1: but I don't know what is..
- 374 P4: the main ideas
- 375 P1: yes, when you need to write the main ideas of the text.
- 376 Me: the main ideas of the text. Like, give the gist you mean?
- 377 P2: Yes
- 378 Me: Ok, what about you Dim
- P2: For me, when you do question and answer at the end, the last part.
- 380 Me: why do you think it is the most useful?
- P2: because that part you have to have understood the text. So if you don't have an overall
- 382 comprehension of the text, you will write questions which are not very good.
- 383 Me: but why do you think it is helpful?
- P2: because it make you focus on the text. Make you think about the text. Make you thinkabout the main ideas.
- Me: I see what you mean. So for give the gist, why do you think it is very useful, or mostuseful?
- P4: because I think that you need to write the things you need to write about this paragraph.
- 389 So you don't understand this paragraph you write the wrong sentences or wrong information.
- 390 Me: Ok, so Carl?
- 391 P3: For me Click and Clank, because you can understand different words and you can
- organise all the text, because when you read for and don't understand any words, you are not
- able to understand the whole text. After Click and Clank, you can.
- P1: For me, like Beta, get the gist. Because you have to write the main ideas. And for me, if I
- 395 write something I..
- 396 Me: In what way do you think it is useful?

- 397 P1: because you have to do like one paragraph and the main ideas of the paragraph. This is
- 398 important and you have to understand. If you don't understand the paragraph you are not 399 going to understand..
- 400 Me: why do you think the main idea is important?
- 401 P1: Because the main idea is like..
- 402 P2: you understand, you get the point.
- 403 Me: Ok, I see what you mean. Any other important, useful parts, you think?
- 404 P4: The Click and Clank is useful also, for me, you have to play with both. I dunno, this is
- 405 Spanish. You have to write main the ideas and also you have to look for the vocabulary you 406 don't know.
- 407 Me: do you see a connection between the 2? Between writing the main idea and finding the 408 meaning of the word?
- 409 P1: yes
- 410 P4: yes
- 411 P2: yes
- 412 P3: yeah because you can write you the wrong idea. Maybe you misunderstand one word and
- 413 write it wrong.
- 414 Me: ok
- 415 P2: and also helpful I think making group. Because you have to find what is the link between
- 416 different ideas.
- 417 Me: you mean grouping?
- 418 P2: yeah grouping
- 419 Me: ok, why you think it is important? In what way is it useful?
- 420 P2: because when you have to find the link between ideas, at the same time you listen the
- 421 ideas of other people, and you have to think about the text in order to find the link. So, maybe
- 422 each group is represent one idea. So maybe yes, each group, for instance there is a certain
- 423 text, and each group can talk about a certain point that is in the text. Maybe in the text there
- 424 are different point, so through the group you can cover the different point, that are discussed425 in the text.
- 426 Me: so, what do you think of grouping? Dim mentioned that grouping is one of the most 427 useful ones..
- 428 P4: yes. And also you can hear how the same idea that you brought before, someone explain
- 429 but in another, a different way. And you can get expression that you think is useful, or better430 than yours, note.
- 431 Me: ok, any ideas about grouping? So you think it's helpful or not. Anyone think that
- 432 grouping is not useful?
- 433 P1: always useful
- 434 Me: what if I, we removed grouping from the programme, would it have an affect, a negative 435 affect?
- 436 P2: I think that the reading became less and less collaborative.
- 437 Me: why?
- 438 P2: because the, why before, doing the grouping, each one have to read his notes, so you are
- 439 force to listen the other peoples idea. And this is the thing that make this method
- 440 collaborative. So if you don't have the groups..
- 441 Me: I see. So, do you suggest another idea, if you want to change this thing in the software.
- 442 Cause that's all about it, we are developing it now. If you don't want grouping, can you think
- 443 of a better way for students to get together and share ideas together.
- 444 P1: it's better if you do in group, but if the method is individual, it is ok, but always it is better
- 445 if you work in a group, I think

- 446 Me: yeah, I mean, do you suggest another way other than grouping? Where you could share
- ideas... Then grouping is fine, but can you suggest other ways? If you don't want grouping..
- 448 can you think of another way that can give you more a chance to discuss, collaborate, and 449 share ideas?
- 450 P4: sometimes I feel that we don't speak too much, we don't discuss too much.
- 451 Me: during grouping?
- 452 P4: Yes
- 453 Me: In what way?
- 454 P4: we only read the notes that we brought, and then say "ah, ok, this is like this, it's the
- 455 same".. and you do the grouping, but you don't discuss about the topic.
- 456 Me: there's no discussion. So how do you make grouping? How do you decide that ok, these 457 ideas can be put together? Would that be helpful or not?
- 458 P1: No
- 459 P4: I don't know, the grouping is ok because you hear, you see what the others note or
- 460 sentences, but you don't discuss about the topic.
- 461 Me: you think there is not enough discussion
- 462 P4: no
- 463 Me: do you have a suggestion that we could make it more helpful for discussion?
- 464 P4: I don't know
- 465 P1: I don't know
- 466 Me: you don't have an idea? Ok, that's ok. We'll move to the opposite exactly. What are the
- least helpful parts? What are the least helpful parts? What are the parts that you think are leasthelpful?
- 469 P1: yes, put the things in the groups, put the ideas in different groups.
- 470 Me: putting ideas in different groups? Is it the grouping itself? Is it the, do you mean the same 471 thing? The grouping?
- 472 P1: yes, maybe. But not.. yes, when you write for example the main ideas or questions, or
- final part that you need to put all the ideas in a group, in different groups.. the similar ideas.. Idon't understand this part.
- 475 Me: you don't understand? You think it's not useful?
- 476 P1: no because the final of the process, I don't see any part that shows all the groups, or the
- 477 conclusion. You understand?
- 478 Me: yes, why do you think it's not helpful. Why is it the least helpful?
- 479 P1: no it's not helpful for me. Maybe we need one step more, the finally, to put the conclusion
- 480 about all the group and say this is the brainstorming, you start here, and say a conclusion.
- 481 P2: maybe she wants close to her, when she does the last part, like a paper, a sheet, where
- 482 there are all the work that you have done up the final section
- 483 P3: yes, I agree with that.
- 484 P2: so you can see the different group, the different ideas, and you can discuss
- 485 Me: ok, so I just need to understand what you exactly mean. Because we were discussing
- 486 grouping, where we had those notes, and we put them at the end in a group, like group one.
- 487 So then, this group will move them. This happens many times, in brainstorming, it happens in
- 488 prediction, and it happens in get the gist, and it happens at the end whilst we make questions.
- 489 So do you mean grouping itself at any time is not helpful, or do you mean the last group, the
- 490 last session, the last strategy, the wrap up?
- 491 P1: yes, it's helpful in the final, the end
- 492 Me: do you mean the final, at the end?
- 493 P1: no, it's helpful, this part, in all the steps, if at the end there is another step that make a
- 494 conclusion, and show all the parts.

- 495 P3: yes, like another screen that you can see all the groups that you have done before. So you
- 496 know, for brainstorming, you did this group, and you can read for..
- 497 P2: Like this, this is the last part, and put here all the things you have done. But maybe the498 software done this but it's not displayed it.
- 499 Me: It's not displaying but when you make it bigger you will see everything, right?
- 500 P1: yes, you can see but you don't use. We don't use this. For me, the last part of the question
- and answer, ok you do the question and answer and finish, but you don't read the groups thatyou did before.
- 503 P2: or maybe this was us mistake, we didn't use it. We didn't use it. But it was there actually.
- 504 Me: Because it is there because you are supposed to read them and to get an idea, and then 505 you write questions.
- 506 P4: for me, finally, have to be like, one note that you have to write about all conclusion of all
- 507 the group. And then you are discussing all the notes that you wrote, you are discussing with
- another person a way to discuss with other groups. Do like a final..
- 509 P1: schema? [not sure]
- 510 P3: maybe something like this.. plus screen, brainstorming, paragraph 1, paragraph 2,
- 511 question and answer, group 1, and group 2, and group 3, and maybe you push..
- 512 P4: and discuss.
- 513 Me: yes, you had something similar to that..
- 514 P3: yes but its very messy
- 515 P1: it's not organised, things here and questions there
- 516 Me: yes, it's multi-touch so you can move it
- 517 P1: yes but it's better if you give
- 518 Me: you have them organised?
- 519 P1: yes
- 520 P2: yes, on the same page, let's say.
- 521 P1: or every member have his screen
- 522 Me: do you think it will be many, it will be a lot of things if you have them all?
- 523 P1: Yes, I need like this.
- 524 Me: ok, so, well, I can see that all these are available here, but you think it could be organised
- 525 in another way?
- 526 P2: yes, another way
- 527 P4: yes
- 528 P1: yes
- 529 Me: because these ones are all multi-touch, so you can move them. Because we had only one
- 530 of these. I think if we had one in front of everybody, it will be a lot.
- 531 P1: no.
- 532 Me: it will be repeated, but if you read this part, you can take a brainstorm and put it in front 533 of you.
- 534 P1: I think it is better.
- 535 Me: which one is better?
- 536 P1: this one
- 537 Me: you have a copy of everything?
- 538 P1: yes
- 539 P2: yes, like each one in a page, with a summary of all the work you have done, up then.
- 540 Me: ok.
- 541 P1: this is like one, and you can see and touch, and I want a brainstorm, so I can click here
- 542 and see the brainstorm.

- 543 Me: right, so you think having one brainstorming wouldn't be helpful, because there is only
- one of each, right? Is that what you mean? So if you want brainstorming, somebody else
- 545 wants brainstorming, is that what you mean? You want your own brainstorming?
- 546 P2: yeah, like your own summary
- 547 Me: so you want brainstorming here, and brainstorming here?
- 548 P2: no, like this is your personal position here. I'm here, and this is where I write, and close to
- 549 me is another page with all the thing we have done to summarise. Because we like, never had,
- 550 we have never had, the stimulation. We never stimulate to open it, because attend this if one,
- to watch all, you have to open all but it takes a lot of space.
- 552 Me: it takes a lot of space, ok. And how do you feel when it takes a lot of space?
- 553 P4: it's like a mess, for me, I feel like..
- 554 P2: maybe your own summary?
- 555 Me: but if you have a summary for everybody, it will get more
- 556 P1: yes but maybe, maybe, only 1. And put in the other screen, after you write the question.
- 557 Write the question and after show all the things in the screen. You understand? Because now
- 558 you write the question, and under the question there are a brainstorming and all the things, so
- 559 I think it's better, first write the question, then show all the opinion.
- 560 Me: well, actually the question is based on all those ideas
- 561 P1: yes but we don't read the other things for example
- 562 Me: you don't usually read them?
- 563 P2: no, never
- 564 P1: no, for me, no
- 565 P4: no, I don't read nothing.
- 566 Me: you don't feel like reading them because..?
- 567 P1: no because you have all the text in your brain.
- 568 Me: so you think you have it so you don't need to look at it again?
- 569 P1: no
- 570 P4: no. but for me, it's like you brought you question and answers and finish. And you say
- 571 something that you don't..
- 572 Me: so do you think it's like a waste of time to go again and read them?
- 573 P4: for me, it's like you do a question and answer, but you don't discuss about the question
- 574 and answer. Finish and like..
- 575 Me: but there is another grouping for question and answers, right? At the end
- 576 P2: yes
- 577 P4: yes there is but you don't discuss about the answers you brought. You only discuss about 578 your questions, but the answers that someone has another opinion..
- 579 Me: I got what you mean, so maybe we will move onto another thing. What do you think, are
- there any other features you would like to see in the reading programme? And you did not see?
- 582 P3: phrasal verbs and idioms
- 583 P1: yes
- 584 P4: yes
- 585 Me: ok, phrasal verbs and idioms. In what ways?
- 586 P2: this is very important
- 587 Me: in the dictionary?
- 588 P2: the dictionary yes because it doesn't have the phrasal verbs.
- 589 Me: ok, what other things?
- 590 P2: when you do Click and Clank you should be able to click where..
- 591 Me: yes I got that, any other things?

- 592 P1: for me it is enter the dictionary. When you do the Click and Clank. The final step is the
- 593 dictionary about what is the meaning of this verb. But I think that have another step that
- appear, this verb but in another sentence.
- 595 P2: another context, yes, I thought the same thing
- 596 P1: examples.
- 597 Me: gives you examples. You need to see examples?
- 598 P4: yes but of a whole sentence. A new sentence with this new vocabulary.
- 599 P2: there is "pull off", it gives you again the sentence with pull off, the text should be better if 600 there is also pull off in another sentences, that make you understand it.
- 601 Me: yeah, I get it. So how helpful, if you go back, this is the fix up strategies. You remember
- the fix up strategies? Where you first have the sentence itself with the vocabulary, then the
- 603 next one is like 3 sentences with the vocabulary itself, with the word that you have difficulty
- 604 with. And then you have a third suggestion where you break the word into prefix and suffix.
- And then you have a suggestion where you break the word into..
- 606 P1: this is the part that I don't like it
- 607 Me: and then the last one is dictionary. So what do you think about that? How helpful were
- 608 the fix up strategies?
- 609 P2: I think that what Lada said, is the one thing that should be had is this strategy.
- 610 Me: because these are 5 strategies, how helpful do you think they are?
- 611 P1: the last one, definition
- 612 P4: for me, the first 3 strategies you do when you are reading
- 613 P2: yeah
- 614 P3: yeah
- 615 Me: what about other things?
- 616 P1: for me, it's not necessary
- 617 Me: do you skip them or go through them? Other fix up strategies?
- 618 P4: you did when you are reading. When you are reading you start, ok, this vocabulary I don't

619 know, so you start and read whole sentence and you don't know. So you begin another time

- 620 the paragraph and you read all, and finally, you don't know, so you are like, ah, I am going to
- 621 click. So when you arrive to the fix up, you did before..
- 622 P3: yeah
- 623 P2: yeah, it was like we touched, we almost never like look the sentence again. We almost
- 624 went to the dictionary.
- 625 Me: you go immediately to the dictionary
- 626 P1: yes
- 627 P4: yes
- 628 Me: how many times did you do that?
- 629 P1: always
- 630 P4: always
- 631 P2: always, because that work, we have done before when reading.
- 632 Me: so you think it's not helpful?
- 633 P2: no, it's helpful but you use it when, while you are reading, and if you don't know
- 634 something you ask to another one. But when you..
- 635 Me: do you ask while reading?
- 636 P2: you ask while reading
- 637 Me: you do that, really?
- 638 P1: yes
- 639 P2: You do this job but while are you reading
- 640 P3: I think it would be more useful, if you before prefix and suffix, it's ok for me because you
- 641 can understand the meaning of the word. Then the meaning, and then when you have read the

- 642 meaning, the paragraph of the sentence, because you have read the meaning and then the
- 643 sentence. So for me, it would be more useful in this way, because before you have read the
- sentence in the paragraph, so you couldn't understand but then..
- 645 Me: can you show me again, so for example, I mean, if you want to design it..
- 646 P3: with prefix and suffix, then dictionary, and then sentence, full sentence, because you have
- read the meaning in the dictionary and now you can read in the..
- 648 Me: do you all agree with Carl?
- 649 P2: no
- 650 P4: in sentence and then another sentence and then different sentence
- 651 Me: different meaning you mean? Or different examples?
- 652 P1: different examples
- 653 Me: so different examples that support the same meaning?
- 654 P1: yes
- 655 P4: yes
- 656 Me: alright. You like this one. Dim do you have..
- 657 P2: I would suggest like this, same sentence for instance, which we had 'pull off', no, just as
- an example. Different sentence but with the same word that you don't know, to try to
- 659 understand
- 660 Me: so you mean the same sentence that came in the passage, in the reading?
- P2: yes, just maybe to have a little discussion to the other about this, no? and to force you to
- think, different sentence with the same word. After like this like work, like prefix and suffix,
- and last one, because this one you just get it reading, this one you achieve the meaning, this
- one just give you.. and if you haven't understood after all these things, dictionary.
- 665 Me: then dictionary at the end
- 666 P4: but after the dictionary I need the sentence
- 667 Me: Beta you prefer this one I think?
- 668 P1: Yes, it's the same as Vick's scenario
- 669 P3: there is a lot. You need something painless, not so complicated
- 670 P2: or you can delete this one, maybe, the first one, that you do while you are reading. You
- 671 can start direct for this, same word, same phrasal verb, different context, different sentence,
- after prefix/suffix. Because I think that the dictionary should be the last one strategy, becauseit is the easy one.
- 674 Me: so more or less it would be the same? So it's exactly the same?
- P4: no but after the dictionary, sometimes I forgot the word. It's like, there are a lot of steps,
- and I forgot the plot of the, or the goal of this.
- 677 Me: right, so we better go to the dictionary, that's why. So which of these do you think was
- the least helpful? Of these 5 fix up strategies. Which ones were the least helpful?
- 679 P3: put the word in the sentence first of all, and then the sentence for me is the least.
- 680 Me: can you order them? From the worst to the best? Which one is the worst for you? Or the 681 least helpful?
- P3: for me, this put the word in the sentence, because you have done before so it's like you
- 683 repeat something.
- 684 Me: Ok, and then?
- 685 P3: then prefix and suffix because sometimes there is a prefix and suffix, and then dictionary.
- In this way it would be more useful
- 687 Me: no, I mean the least helpful
- 688 P3: yeah the least
- Me: if you want to put the least helpful here, there are 1, 2, 3, 4, 5, so the dictionary is here,
- 690 because it is the most helpful you think.
- 691 P2: put the word in the sentence is the first one

- 692 Me: that's the word sentence, ok
- 693 P4: when you have the sentence, and another part of the paragraph, for me is the worst.
- 694 P1: for me as well, word in the sentences
- 695 Me: ok, and then? The prefix and suffix? And then
- 696 P4: and the fourth, what is?
- 697 Me: it's when you break the words into different, to other semantic derivations.
- 698 P2: it is this one, prefix and suffix when you broke the word
- Me: no, that's, there are derivations, for example 'relative', it will have 'relation'...
- 700 P1: but we have never used this
- 701 Me: you've never used that one?
- 702 P4: no
- 703 P1: no
- P2: because it was always the same, relative and unpredictable. It doesn't work for differentwords
- 706 Me: ok, I see what you mean. So do you have any suggestions with regard to fix up
- 707 strategies? I think you mentioned that, all the suggestions. So do you think the reading
- 708 programme had an impact on your English language learning in general? And in what ways?
- 709 P1: I think it's only 5 sessions, and we didn't have enough time.
- 710 Me: it didn't have any affect on your language learning at all, in these 5 days?
- 711 P1: no, in 5 days?
- 712 P3: in 5 sessions, maybe some words, but not much..
- 713 Me: you think you learned some words?
- P3: yes. Maybe a procedure, maybe for reading, I can, I learned a procedure try to applicate
- for paragraph, try to understand the meaning.. things I told you before
- 716 Me: ok, Dim
- P2: the same I told you, about the importance of writing question, writing main ideas, those
- are the main things that can impact. But as, I mean, if you do this kind of job, this kind of way
- to reading for different times, but you do it in a school, you will get used to having this kind
- of approach, and you will try to get the point while you are reading, because it's the main
- 721 objective while you are reading, so..
- 722 Me: ok, is there any impact on your learning?
- 723 P1: maybe it's not impact me English because we only have 5 session
- 724 Me: so it didn't add anything to your English
- P1: no, but maybe it's another method of make a readings, one part of this.
- 726 Me: right, any additions, any suggestions?
- 727 P4: for me, I think we did only this, but if someone then review my answers, or our speaking,
- 128 I think I am going to learn more. Because, ok, I read, I brought my ideas, but nobody told me
- 729 if I brought a good idea, so I don't know.
- 730 Me: ok, I see what you mean
- 731 P2: yeah this is also good point, there isn't like a check
- 732 Me: there is no assessment
- 733 P2: if you have written correctly or not
- Me: I do have the assessment but it's not been, it's ready yet.
- P2: maybe also the programme could do this job. Like recording you and record all your
- 736 mistakes. And after when you finish it give you like a report
- 737 Me: you think that the programme can assess you? Kind of an assessment?
- P2: yeah like a report, it says you have done this kind of mistake. While you were speaking
- while you were writing, you have done this kind of mistake. Programme will do a lot of
- 740 complicated things.

- Me: right, ok, the next one. If you are in charge, what would you do to make the programme
- 742 better?
- 743 P2: if you were in charge, grammatically..
- 744 Me: yeah, if you were in charge, because you are not in charge. You are like in the school.
- 745 P3: second conditional
- 746 P2: second conditional
- 747 P4: For me, the last part, after the last part, a discussion... Brought a main idea of all together,
- and you have to discuss, you have to say, ok, for me this is the main idea, or for me, this is my
- opinion, or something. So you have to give your ideas, so you are speaking and also
- 750 improving you English. In the last part, another step about all the test and you have to give
- 751 you opinion about something.
- 752 Me: ok. Any other suggestions? If you were in charge, what would you do?
- P1: yes, I agree with Lada, I think that if you want to sell some product, you need to give
- some difference between the competitors and other products on the market. So you need one
- difference, and I think that in your produt the difference is that you can discuss with other
- members in the group. So I think that the last step is very important. Because if you want to
- sell this product in the market, there are too much, so you need a difference. So I think that
- the last step is very important.
- 759 Me: ok, to add, so you agree with Lada
- 760 P1: yes, you need to make a discussion, the last discussion, a comclusion
- 761 Me: so you think writing a question and answers is not enough to write to make a conclusion?
- 762 P1: It's not enough if you don't make a discussion
- 763 Me: ok, so you think questions and answers and making groups isn't enough?
- 764 P1: it's not enough
- 765 Me: why? What is the problem with the question and answer that it doesn't..
- P4: it's not a problem, but for me, this programme could be better because you can speak, you
- can read and you can write.. it take a lot of parts of English, it's not only reading, for me, thisis not only reading
- 769 Me: right but the question is about how to improve it. How would you improve? Make it 770 better?
- 771 P4: because you can speak more if you do the last part of discussion.
- 772 Me: I see, do you have an idea how we could design this discussion thing?
- P3: I don't know because you are risking to get in the programme some complicated things.
- The things that are working are the painless things. If you add things, maybe it's not..
- 775 Me: so you think too many things would make it complicated?
- P3: yes. You can add a lot of things for me, so maybe the same steps but maybe improve
- some things, because if you add a lot of things, you complicate it.
- 778 Me: yeah making it better doesn't mean adding, it could mean taking out things, or it could be 779 changing things.. so we have addition, or deleting, or changing..
- P4: for me, change, one is what I explain before about Click and Clank. This is one difference
- that you have to take out some parts, like the phrase.. but for me, when I brought the question
- and answer, I brought and ok, but.. do you take out this, or?
- 783 P1: we need more, we need to finish together
- 784 P4: yes, its like you don't finish, you finish alone.
- 785 Me: you mean you want to agree upon one thing? You want all to discuss rather than answer
- 786 questions?
- 787 P4: yes
- 788 P1: the general idea
- P2: I think that actually you have the chance to discuss, when, while you do grouping, maybe
- to make people discussing, you just can say "discuss about your idea, compare you idea" and

- after making group. Just in the screen that appear, that you have to do like a discussion.
- 792 Because you have the chance to discuss, always you have the chance to discuss.
- P4: but I am not thinking only like an English student, I am thinking in a business. For me,
- 794 I'm thinking in more. This programme could be better, and could be like Beta said, developed795 programme.
- Me: that's good, I think I got your ideas. Then lets move to, what do you do when the text..
- 797 ok, now lets get more focused on a different thing. Now its more about the reading itself.
- What do you do when the text becomes difficult while reading on the Tabletop computer? So
- you are reading and you find the text difficult. What do you do? What do you usually do?
- 800 Who wants to start? Did you understand the question?
- 801 P1: yes
- 802 P3: yes
- 803 P2: I ask to someone else for some words that I don't know, and that can help me to
- 804 understand the meaning of the text
- 805 P3: I read again, the paragraph, to try to understand something that maybe before I wasn't
- able to understand
- 807 P4: the same of Carl
- 808 P1: the same, if I don't understand, I ask
- 809 Me: so you start reading again..?
- 810 P1: yes, and if I don't understand, I ask
- 811 Me: you ask your friends? Alright. So, any other suggestions, things you wanna say? What do
- 812 you usually do? What do you do when you have things difficult? So either you read again and
- 813 then ask your friends, or you do both?
- 814 P3: both
- 815 P2: both
- 816 P4: both
- 817 Me: So, how helpful was the group discussion? Would you explain further? When you get in
- 818 groups and discuss, how helpful was that?
- 819 P3: but for me this is one of the danger of this programme. Because maybe it's not work. The
- thing that the programme doesn't work very good, very well. Because for a discussion, I think
- you need to be concrete. If all of people, if everyone is giving he's opinion, it's ok. But just,
- you cant stand on this question for a long time, because it becomes annoying. Its just a
- 823 discussion but not enough time, you give you opinion, and if you cant get a conclusion all
- together, it's ok, nothing happens. But if you are discussing for a lot of time, for me it's notthe best, because..
- 826 Me: I see. So you think that it takes time for discussion?
- 827 P4: I think that we didn't spend too much time to discuss about in this discussion.
- 828 Me: yeah, so just to, this isn't about the grouping only, it's about the group discussion,
- 829 whenever you get together to discuss as a group. So, any ideas about group discussion? How
- 830 helpful was the group discussion?
- 831 P2: I think that I have already said about it. I think that it is good because you share ideas, you
- listen other people's ideas, you try to find a link between ideas, and you can have an overall
- better comprehension, because maybe you don't get some points that another one gets. So at
- the end of making group you have got your point and also the other points, points of other
- 835 people, so you can have a better comprehension of the text.
- 836 Me: ok. Any other comments?
- 837 P1: no
- 838 Me: Ok, so, how do you help, now think about yourself, how do you help one another to
- 839 understand the reading text? How do you help one another to understand the reading text?
- 840 How do you help one another?

- P2: yeah yeah, in this way, if he doesn't know the meaning of a word, I just use the same
- 842 word in a different context, and a context maybe he already knows, in a context that is
- familiar for him. And use a sentence that maybe he already know, but using different wordsbut they have the same meaning as a word he already know.
- Me: how do you know that he doesn't know a word? How do you discover that a person
- 846 doesn't know a specific word?
- 847 P2: because he ask me.
- 848 Me: he usually asks? If somebody doesn't know a word they ask.
- 849 P1: yes
- 850 P3: yes
- Me: Do they ask in generally or.. I mean for yourself, do you usually ask generally or you just ask.. you ask one another.. so how would you
- P3: just explain the meaning. Sometimes we did that because we use our own language to explain the word.
- 855 Me: sometimes you use that, really? I wouldn't think
- P3: not a lot but sometimes when you are not able to explain in English.. ok, first you try to
- 857 explain in English but if you cant, you use your own language.
- 858 Me: ok, Lada, you have a way that you usually help one another?
- P4: it's the same I think. What is the meaning of this word? And, the meaning or sentence..
- 860 but with a simple sentence.
- 861 Me: ok, any other suggestions? No, ok, we are done with this. So how do you help one
- 862 another to overcome difficulties, such as unknown vocabulary and unclear difficult ideas?
- 863 P4: the same
- P2: the same
- 865 P3: yeah
- 866 P1: yeah
- 867 Me: because sometime to understand the meaning there are some... so always you think there
- is a vocabulary problem to understand the meaning? Sometimes there is no vocabularyproblems..
- 870 P1: no, sometimes the sentence in general..
- P3: sometimes the meaning of the words is different of the..
- 872 Me: yeah sometimes there is come some difficult ideas. In this case, what do you do? If it is
- 873 not the vocabulary
- 874 P3: try to explain less
- 875 P2: yeah try to explain in different, easy words
- 876 Me: so you ask usually?
- P2: yeah, what does it mean this sentence? And after the other people just say its like this it's
- 878 like that for example
- 879 Me: do you find the Table, the programme helpful in this case? That you my ask help from
- the Table?
- 881 Me: so you think it's an advantage to have 4 students.
- 882 Me: ok, that's all

## Appendix 11: Video sample of students' activities on the tabletop surface

The following links is for a screen recording of the DCSR application:

https://www.dropbox.com/s/mnh3kxchnk5ofhm/DCSR\_Screen\_Recording%281%29.m4v?dl

<u>=0</u>

(A CD version is attached)



## Appendix 12: Snapshots of technical problems reported to the programmer





anadian undergraduates about

## Appendix 13: Project Approval Record

	M										
Carolyn Letts	25	Programme Start Date		Start Date	End Date	Submission Date Title				Area of research	
aul Seedhouse	-	Int PhD Edu & Applied Ling (FT) (8182F) Se		Sept. 24, 2007	June 25, 2016	June 23, 2016	Investigating S	caffolding during Collaborative Reading on the Tabletop Computer		Computer Assisted Language Learning	
ott Windeatt	M	Supervisors (cab) Proposed Supervisors (recorded to part of evolution account form)									
(c)		Name				Solir		Name Snlir			
<i>,</i> ,		Scott Windeatt			70%			None recorded			
Iross	M	Patrick Olivier				15%	None recorded				
n Berry	-	Ahmed Kharrufa			15%						
Nicola Houghton	M										
		Examiners (SAP)					Proposed Examiners (recorded as part of nomination of examiners form)				
		Name	Position		School		Туре	Name			
		PROF. S Higgins				Н		Steve Higgins	ve Higgins		
		Prof. P Seedhouse	<sup>3</sup> Seedhouse Prof of Education & Appli Education, Com			Communication	Р	Paul Seedhouse			
		Student sponsors (SAP)					Student process (SAP)				
		Sponsor Acade			ademic Year			Process	Programme		Process Date
		SAUDI ARABIA SAUDI ARABIA		20	2007 / 2008		Project Proposal Approved	Int PhD Edu & Applied I	.ing (FT)	Dec. 12, 2008	
				20	2008 / 2009		Signed Learning Agreement	Int PhD Edu & Applied L	Ling (FT)	March 15, 2010	
		SAUDI ARABIA 20		09 / 2010							
		SAUDI ARABIA 20		10 / 2011							
		SAUDI ARABIA 20		12/2013							
		SAUDI ARABIA 2013 / 2014									
		SAUDI ARABIA	ARABIA 2014 / 2015								
		CALIDI ADADIA		20	15/2016						