SCAFFOLDING FOREIGN LANGUAGE LEARNERS' READING STRATEGIES
USING TABLET COMPUTERS AT TWO SECONDARY SCHOOLS IN
DENMARK

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ABSTRACT

The use of mobile devices for learning has led to an increased number of textbooks and reading materials being published in digital format. Specific digital literacies are required to take advantage of these digital texts, and students need to acquire these literacies if they are to read and learn efficiently. Teachers need to assist their students in reading with digital devices. However, research on supporting reading comprehension with mobile devices is still limited. This thesis addresses a gap in the field by identifying cognitive and metacognitive foreign language (FL) reading strategies that students employ when using tablets, and how digital features may support FL reading comprehension.

Students learning Spanish at two educational institutions in Denmark (n=12) participated in this longitudinal qualitative study. The digital texts employed in the study were designed to model reading strategies by embedding prompts in the texts using features of the iBook Author application on the iPad. These prompts, which appear alongside the text for students using the iBooks app, provide opportunities to learn and practice reading strategies. Data collection was via students' logs (records of their use of reading strategies with the iPads over three weeks), semi-structured interviews and a researcher's log. Coding was conducted through thematic analysis. The findings indicate that students used a variety of metacognitive and cognitive reading strategies. Students engaged in higher-order thinking skills by following the scaffolds provided and benefitting from some of the iPads' features.

In conclusion, provided that the student is active in the reading process and is using appropriate strategies, he or she will be able to construct meaning from the digital text. FL reading is a skill that needs to be adapted for the use of mobile

technology. This research suggests that, when employed effectively, the applications available on tablets can provide scaffolds for the reading process.

This thesis contributes to knowledge by: 1) applying a language learning strategy (LLS) model to mobile technology; 2) applying metacognition in the context of reading electronic books with mobile devices; 3) addressing controversies in the field of digital reading; 4) proposing guidelines for designing digital textbooks, and 5) developing a research instrument for reading strategy research.

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1. INTRODUCTION

1.1 The context

Technology-enhanced learning (TEL) refers to the application of technologies to teaching and learning (Kirkwood & Price, 2014). With the increasing use of mobile technologies in the classroom over the last decade, research on mobile learning has grown and it is now a well-established field in its own right (Traxler, 2011). Mobile devices are now effective tools for learning; learning can take place anywhere and young students utilise these devices for informal learning (Levinsen & Sørensen, 2008).

The use of mobile devices for learning has led to an increased number of textbooks and other reading materials being published in a digital format. In Denmark, government policy has led to an increase in reading digitally (The Danish Agency for Digitisation, 2011). More generally, our knowledge-based global society requires that students develop new digital literacies (Leu, 2000; Strømsø & Bråten, 2008; UNESCO, 2008). Therefore, educational institutions and teachers need effective ways to assist students in reading with digital devices.

There is much debate on whether print format is more effective for learning than digital (Baron, 2013; M. Wolf, 2010). Because the medium influences the way we read, students might be less inclined to reflect when they read digital texts (M. Wolf & Barzillai, 2009). Mangen, Bente, and Brønnick (2013) argue that reading texts on a computer screen is detrimental for reading comprehension. However, their study used PDF scanned files as the digital material; thus, it did not take advantage of all the possibilities of the medium, such as inserting a table of contents (whereby you can click to navigate to specific chapters or sections) or embedding video or audio.

I shall argue that the debate should focus, not so much on what text format is best for learning – print or digital, but on what reading skills students need in order to read and comprehend texts effectively in the digital environment. Since students increasingly read digital texts for their courses, we need to support their

reading processes in this medium. Their success in learning will depend on their ability to understand and use the information in these texts.

Due to globalisation, research in the field of foreign language learning has experienced considerable growth in the last decades. Foreign language learning research has investigated the effects of instruction in face-to-face settings and with conventional print materials since the late 1960s. Research on foreign language with technology began with the rise of technology in the 1990s, first with computers – giving birth to a new field of computer assisted language learning (CALL), and then with mobile devices – mobile assisted language learning (MALL).

1.1.1 Foreign language learning (FL) and second language acquisition (SLA): key concepts and issues

The field of second language acquisition (SLA) studies the processes involved in learning a language other than the person's native language (also called first language (L1) or mother tongue) (Mitchell & Myles, 1998/2002). Chronologically, a mother tongue is the first language acquired. There can be more than one mother tongue, such as in the case of bilinguals or trilinguals. The terms foreign language (FL) and second language (SL or L2) are used interchangeably in the literature when referring to a language that is not the mother tongue. The reason for this is that most research in the field is concerned with the commonalities between the two terms: the processes involved in learning a language other than the native language.

However, sometimes we need to be more precise about the circumstances in which the process of learning takes place. In this case, there is an established difference between the two terms: FL is the non-native language learnt in a context where this language is not present outside the classroom (Lightbown and Spada, 2006) – for example, learning Spanish in Denmark. Since the FL is not in the social environment of the learner, FL learning depends more on classroom instruction and the learner's autonomous learning. On the other hand, if the context of the target language ('TL', i.e. the language being learnt) is used in the

community, the learner experiences situations of "real" communication with native speakers of the TL. In this case the term used is second language (SL or L2)[1] (Ligthbown and Spada, 2006). Being able to use the TL outside the classroom increases opportunities for practice and acquisition. In addition, if the learner uses the language in a wide range of social situations and/or in connection with their professional life, they are more likely to appreciate the value of acquiring the new language. This, in turn, increases motivation, which has an impact on learning (Masgoret & Gardner, 2003). An L2 context could be, for example, a foreign student learning Danish in Denmark.

The field of second language acquisition is included in the larger field of applied linguistics. There has been much debate over whether the epistemological frame of SLA is applied linguistics, or language and literature didactics. The field of applied linguistics is based on research in linguistics and psycholinguistics, while language and literature didactics is based on research in pedagogy. Therefore, language and literature didactics is not concerned with L2 or FL acquisition processes.

Applied linguistics has been the subject of criticism and misunderstanding, in part because of the ambiguity of the concepts "theory" and "application" (Pastor Cesteros, 2004).The first step in obtaining a clear definition of applied linguistics, as proposed by Pastor Cesteros, is to explain the objectives of the discipline, namely, "it does not follow the mere acquisition of knowledge, but instead it relates knowledge to its possible applications in order to solve controversial aspects related to social interaction and linguistics." (Pastor Cesteros, 2004, p.28. My translation[2] - hereafter MT). That is to say, applied linguistics is not just theory (linguistics theory) applied to practice but a field which draws on many different fields depending on the linguistic application, such as second language theory, translation studies, linguistic computing, treatment of pathologies of language, etc. For instance, speech-language pathology is an interdisciplinary

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[1] I will not use this distinction in this thesis. Unless otherwise specified, the terms are used interchangeably.

[2] "[…] que no persigue la mera adquisición de conocimientos, sino que relaciona éstos con sus posibles aplicaciones para resolver aspectos conflictivos relativos a la interacción social y lingüística".

area involving various disciplines such as linguistics, medicine, psychology and pedagogy.

The field of second language acquisition is an interdisciplinary field drawing on psycholinguistics, linguistics, sociolinguistics and pedagogy and it has a recent history. In 1967, Corder published "The significance of learners' errors" focusing for the first time on studying the language produced by second language learners (Error Analysis) instead of focusing on the mother tongue. Research before this publication was more concerned with comparing two different languages (the mother tongue and the target language) in order to predict areas of difference and difficulty (Contrastive Analysis). Error analysis was then concerned with the learner's perspective, how learners acquire a second language, while Contrastive Analysis explored teaching methodologies from a point of view of the language. There was, then, a shift to the learner, which is the focus of this thesis.

Since Corder's publication on learners' errors, research in the field of SLA has explored how a second language is acquired and the mental processes the second language learner engages in to achieve proficiency in another language. In 1982, Krashen put forward five hypotheses regarding SLA. The first hypothesis concerned the acquisition processes. Krashen (1982) distinguished between "acquisition processes" – unconscious processes involved in learning the mother tongue – and "learning processes" – conscious processes involved in learning a non-native language in a formal context. The distinction between acquisition and learning and the connection between them has been widely debated. Krashen did not prove his hypotheses, nor did he suggest how to prove them (Ellis, 1990). Nevertheless, a considerable amount of studies were made in order to support or refute Krashen's hypotheses, and in this way research in the field of SLA began in earnest. Today the bibliography in the field of SLA is vast and it covers different perspectives, making SLA a well-established field.

In the 1970s and 1980s, most of the studies were conducted in the English-speaking USA and UK; the objective of these studies was the acquisition of a second language rather than a third or fourth language. However, much of Europe has a different socio-political context. The existence of different regions

within a country, each with their own language, has given rise to another multilingual reality. In addition, the mobility allowed by the border-free Single Market (declared complete on January 1993), which guarantees the free movement of goods, capital, services and people within the EU's 28 member states, has created a necessity for increased communication within the member states. Therefore, proficiency in several Community languages became important for many individuals. One of the objectives identified by the 1995 White Paper, *Education and Training: Teaching and Learning towards the Learning Society,* was "proficiency in three community languages" (Commission of the European Communities, 1995, p.47). The Commission proposed in 1995 that the teaching of two foreign languages should be compulsory in schools across the union.

As a result, a considerable number of studies on third language acquisition and multilingualism began to appear in the 1990s investigating, among other things, whether there is a difference in learning a second language and a third or subsequent language and the impact of bilingualism on L3. One of the answers to this question is found in the Dynamic Model of Multilingualism (Herdina and Jessner, 2002), which explains the language learning processes observed in speakers of more than one language from a psycholinguistic perspective. Multilingual acquisition is defined as "the process of acquiring more than two languages. It thus comprises the consecutive and simultaneous acquisition of three or more languages." (Cenoz and Jessner, 2000 p.39). In this thesis, I will use the term FL, since the context in which participants of this study learn Spanish is formal and it is the third or fourth foreign language learnt in Denmark, not the second. However, when reviewing the literature, I will maintain the terms used by the authors, that is, either SL, L2 or FL.

SLA research is a wide field and different perspectives have been used in order to explain the complex processes involved in learning a foreign language. From a linguistic point of view, the focus has been on the acquisition of language structures and on errors. Psychological approaches such as the cognitive model and information processing models are concerned with the mental processes of the learners and their interaction with the input. Sociolinguistics emphasizes the

role of social differences in the process of learning. Finally, interactionist models focus on the types of interaction in which learners engage.

1.1.2 Language skills

In SLA, the different ways in which the language is used (speaking, reading, listening and writing) are called language skills (Tornberg, 1997/2003). Different teaching methods emphasize one skill to the detriment of others (Richards and Rodgers, 2003). Ideally, all four skills should be integrated within the same session (Pastor Cesteros, 2004). For example, watching a video and taking notes (listening and writing) in order to speak about the topic afterwards (speaking) with a supplementary text (reading). However, depending on the context, it could be desirable to emphasize one skill. For example, in a foreign language context, the practice of listening comprehension is more important as learners are not exposed to the target language outside of the classroom (Chang, 2009), since that language is not in frequent use in the local community.

Even though the use of technology is seen to have a positive influence on the development of the four language skills (Stepp-Greany, 2002), little research exists on the acquisition of these skills with new technologies.

1.1.3 Reading strategies

In order to understand a written text, it is necessary to train perceptive and cognitive skills (Pastor Cesteros, 2004). From all the complex mental processes involved in reading comprehension, this thesis will focus on the use of cognitive and metacognitive reading strategies, which is relevant for using technology to support FL reading (Chun, 2006).

Cognitive strategies support the learner in constructing and applying L2 knowledge (Oxford, 2011). For example, activating prior knowledge and inferring meaning are examples of cognitive strategies.

Researchers have categorised learning strategies in different ways (O'Malley & Chamot, 1990; Oxford, 1990; Wenden, 1987) but most agree on the detailed

definitions of metacognitive strategies, i.e. that these include: planning, monitoring, and evaluating. In foreign language learning, metacognitive strategies are actions used to control the processes involved in language learning (Oxford, 1990). Research has shown that the use of metacognitive strategies enhances both listening comprehension (Vandergrift, 2004; Goh, 2000) and reading comprehension (Boulware-Gooden, Carreker, Thornhill, & Joshi, 2007; Macaro, 2009) at different education levels.

According to Perfetti, Landi, & Oakhill (2005), reading comprehension "occurs as the reader builds a mental representation of a text message" (p.228). Research on reading has shown that a good understanding of a text requires that learners use metacognitive strategies such as: identifying and planning the task, monitoring and self-evaluating their own progress (Arnbak, 2003). Research evidence indicates that there is a positive relationship between the use of metacognitive awareness of reading strategies and FL reading ability (Sheorey & Mokhtari, 2001). Raising students' awareness of the various cognitive and metacognitive strategies that they can use for reading will enable them to choose the appropriate strategies for better comprehension.

However, research has shown that foreign language learners do not use metacognitive strategies as often as other strategies such as cognitive strategies (Oxford, 1990). In addition, the repertoire of metacognitive strategies that are used is limited; language learners use planning but they use very little self-monitoring and self-evaluation (Oxford, 1990). Therefore, learners would benefit from a better understanding of metacognitive strategies, and these can be learned through instruction (Chamot, Barnhardt, El-Dinary, & Robbins, 1999; Nunan, 1997).

Interactive comprehension instruction is research-based reading instruction where the teacher models cognitive and metacognitive reading strategies while reading a text and thinking aloud at the same time (Lapp, Fisher, & Grant, 2008). Based on a constructivist approach to learning, the teacher uses scaffolding in reading and assists the students by modelling the strategies. For students to

develop effective reading, teachers must explain and support the use of strategies that can help them to reflect on and self-evaluate their reading.

Being aware of one's thought process is important in face-to-face teaching but perhaps even more so in MALL where the design leaves students with a higher degree of autonomy. In MALL, it is essential for students to self-evaluate and monitor their knowledge. The development of students' autonomy in using digital material is essential.

Since learning now takes place more and more outside the classroom through mobile devices (Levinsen & Sørensen, 2008), learning how to use cognitive and metacognitive strategies in FL reading needs to be mediated by the technology. That is to say, technology should take the role of the teacher in scaffolding and modelling reading processes.

1.2 Statement of the problem

1.2.1 Students require training in reading strategies in the digital environment

While some decades ago it was the teacher who was the one who controlled the learning material (Pastor Cesteros, 2004), today, students can use the internet to access a wide variety of learning material. Since much learning takes place also outside the classroom, we need to help students by providing activities that engage them in cognitive and metacognitive processes. Therefore, students need to learn strategies and become autonomous in this relatively new environment.

As more and more information is in digital form, it becomes imperative for educational institutions to provide ways of supporting students' digital reading. Moreover, traditional print texts do not equip students with the appropriate reading skills for digital reading (Kymes, 2005).

Metacognitive and cognitive reading strategies in foreign language learning have been predominantly studied with conventionally produced texts. Research on reading (A.L. Brown, 1980; Pressley & Afflerbach, 1995) has shown that the use of these strategies enhances reading comprehension, but most of these studies have been conducted with print texts.

Metacognitive and cognitive reading strategies are also crucial in comprehending e-material (Verezub & Wang, 2008). Few studies (Chun & Plass, 1997; Gegner, Mackay, & Mayer, 2009; Mayer & Moreno, 2003) have examined in which way technology should be developed for improving reading in L1 and L2. Gegner et al. (2009) have shown that in computer-based environments embedding reading strategies, such as activating background knowledge, enhances students' reading comprehension. Azevedo (2005) provides a useful approach to teaching metacognitive strategies in computer environments by modelling metacognitive strategies while learning with hypermedia. Bundsgaard (2008) points out that reading from the Web is a challenge for students and he provides an approach to searching for information and reading it on the Web. His approach stresses the importance of using reading strategies when looking for information on the Web.

Regarding the field of mobile learning, the question of how mobile technology can assist FL reading has been the focus of few studies. Theories on reading comprehension are based on studies that were conducted before the entrance of mobile devices, and they are not informed by studies that describe the reading process with mobile devices. Missing from the literature on reading processes are studies that investigate what reading skills students need to learn to be strategic readers while using mobile devices. Therefore, the question of how students use strategies through technology to understand a foreign language is relatively unexplored.

1.2.2 Lack of FL digital reading material grounded in research-based theories of reading comprehension

With the increasing use of digital material such as websites, podcasts, and e-books for foreign language learning, there is a need to evaluate digital content

drawing on foreign language acquisition research (Chapelle, 2009). While teachers can design for learning, they need to know how this can best be achieved (Kukulska-Hulme & Jones, 2011).

As discussed earlier, Mangen et al. (2013) compared reading printed text with reading the same text digitally (as scanned PDFs). They found that the group reading digitally scored less on comprehension measures than the group reading print. Mangen et al. (2013) argue that issues of navigation within the document, among other things, might be the cause of the lower scores in reading comprehension. In their experiment, the PDF format they used did not take advantage of the digital medium. For example, it did not include an outline, table of contents, or other features that modelled reading strategies and supported comprehension. To address these issues, there is a need to develop digital reading material grounded in research-based theories of reading comprehension. Further, work is needed to identify the potential of digital materials.

1.2.3 Students' lack of skills for reading effectively with technology

Students experience difficulties in reading with electronic devices and we cannot assume that students' existing knowledge of mobile technologies will provide them with the required skills to read digital text effectively (H.R. Schugar, Smith, & Schugar, 2013). There is also a need to identify the technical features that support reading processes, so that students can take advantage of the various features that technology offers. Previous research that examines the relationship between e-books and comprehension does not clarify how e-books' features support or inhibit comprehension (H.R. Schugar et al., 2013). There is a need for theoretical connections between reading strategies and features of the mobile devices. Regarding mobile devices such as iPads, there is no research on how iPads' features can model FL reading strategies and how they can support comprehension.

This thesis addresses existing deficiencies in research on digital reading and mobile learning by investigating students' use of FL reading strategies when reading digitally using tablets (iPads). This study is a longitudinal, multiple case

study, focusing on how FL learners extract meaning from the digital texts when reading on iPads. It draws from the following fields: foreign language learning, technology-enhanced learning, metacognition, learning strategies, and reading. Specifically, it focuses on metacognitive awareness and foreign language reading comprehension processes in a mobile environment based on the Strategic Self-Regulation (S²R) Model of language learning (Oxford, 2011). The S²R Model is a comprehensive classification of learning strategies. It comprises three dimensions of L2 learning: cognitive, affective and sociocultural-interactive. In this model, cognitive strategies facilitate both learners' L2 knowledge construction and the application of L2 knowledge. Affective strategies support learners in coping with their feelings and attitudes, helping them to stay motivated. Sociocultural-Interactive (SI) strategies help learners deal with communication, sociocultural contexts, and identity. These strategies are coordinated by metastrategies, such as planning, monitoring and evaluating.

1.3 Research Questions

The research problem was narrowed throughout the research process, from students' FL reading on e-readers to the students' use of FL reading strategies on tablets. The complexity of the reading process led to a focus on one of the multiple components of reading, namely, reading strategies. Three main issues were identified: 1) students require training in reading strategies in the digital environment; 2) a lack of FL digital reading material grounded in research-based theories of reading comprehension, and 3) students' lack of skills with technological features for reading effectively.

This study thus extends previous work in that it focuses *both* on how FL students extract meaning from digital texts in a foreign language using tablets, and on how the electronic features support reading comprehension. Thus, the purpose is to identify not only the strategies employed by FL learners but also to determine which features in the mobile device helped them to understand the texts.

The overarching research question guiding this study is:

How can mobile technology mediate FL reading strategies?

It has been addressed in this study using these two research questions:

> *1. To what extent do learners of Spanish employ cognitive and metacognitive reading strategies when reading with tablet computers?*
>
> *2. Which functions of tablet computers facilitate the use of FL reading strategies?*

The study was conducted in four phases. The first phase (the pilot) took place over a period of 4 months from March to June 2010. The second phase took place in September 2012, the third phase in October 2012, and the fourth in March 2013. All phases covered a four-week period.

1.4 Contribution to knowledge

The results of this study address the scarcity of research on digital reading that can help teachers to understand their students' FL reading behaviours with mobile devices. These results also facilitate research-based recommendations that can be employed to better meet the expectations of digitalisation in schools. To my knowledge there has not been any published research within the field of FL digital reading that has been conducted within the framework of strategy learning using tablets. Therefore, this research may reveal reading behaviours that differ from other digital materials such as web pages and PDF files, or other hardware such as stationary computers. The more information collected in the digital reading body of literature, the better able teachers will be to instruct students in a way that best suits curriculum objectives.

Furthermore, it proposes a new answer to the question of whether digital reading hinders reflection. It adds a new argument to how strategy learning might be mediated in the S²R model (Oxford, 2011) by documenting the way in which technology can mediate student's strategy learning.

The practice-related contributions include guidance for teachers and publications on how to train and design digital FL reading materials. The study can also help policy makers in creating or adapting the curriculum.

1.5 Outline of this thesis

Before using technology to develop a language skill we need to know what research has shown about how that particular skill is learned, so the potential of technology can be fully exploited (Chun, 2006). Therefore, Chapter 2 reviews theories of reading, metacognition and learning strategies that provide the theoretical background for this study.

In order to locate the present research, Chapter 2 presents the key debates on the use of technology for supporting specific components of FL reading, specifically reading strategies and why this thesis looks at this debate in a different way.

Chapter 3 presents the pilot study and its implications for the main study. Chapter 4 describes how the main study was conducted by presenting the research paradigm guiding the research process, the research setting, the data collection methods, material and apparatus, procedures, analysis of data and ethical considerations.

Chapter 5 presents and analyses the data without references to other research from the main study, while Chapter 6 discusses the results with reference to the research discussed in Chapter 2 and to new literature as appropriate.

Finally, Chapter 7 presents the contributions of this thesis, its limitations and suggestions for future research.

1.6 Chapter summary: Introduction

This chapter introduced the field of foreign language (FL) learning and other key concepts. There are four language skills: speaking, listening, reading and writing. This thesis focuses on reading, as there is a need to clarify how to teach students to read digital texts in a foreign language effectively and how to best use the electronic features of mobile devices to support comprehension. This research takes place in a context where mobile technology has grown rapidly in the classroom. The research for the thesis involves two secondary schools in Denmark. The two research questions of this thesis are: To what extent do Spanish learners employ cognitive and metacognitive reading strategies when reading with tablet computers? Which functions of tablet computers facilitate the use of FL reading strategies?

This study advances knowledge within the field of digital reading and mobile devices. It also contributes to practice by providing guidelines on how to train students to read digital texts in a foreign language. Finally, it benefits policy makers who can create or revise policies based upon these findings.

2 LITERATURE REVIEW

This thesis investigates foreign language learners' reading behaviour when using tablet computers. There is little research available specifically in this area. Therefore, foreign language (FL) acquisition processes were examined from five different perspectives, namely: reading, metacognition, learning strategies, foreign language learning, and technology-enhanced learning. The relationship between these areas denotes the focus of the research (Figure 1). Together, these will allow a conceptual framework to be built to guide the study.
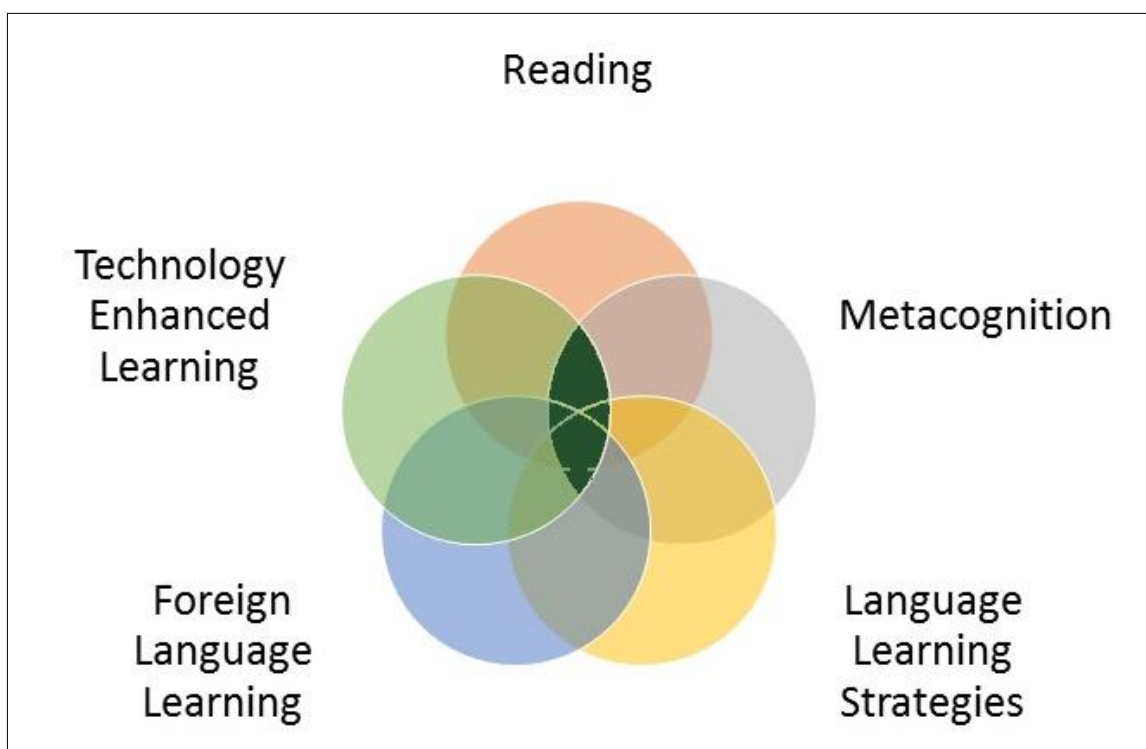
Figure 1. Five main areas of the study

In examining foreign language learners' reading behaviour and their use of handheld devices, research from different theoretical perspectives was needed. Research in the field of metacognition provides a model for self-regulated learning, which is one of the components for successful learning, especially mobile learning (Sharples, 2002). Research on metacognition also provides a framework for enhancing the comprehension processes (Vandergrift, 2004).

Research on reading (Arnbak, 2003) has shown that a good understanding of a text[3] requires learners to use metacognitive strategies, such as: identifying and planning the task, monitoring and self-evaluating their own progress. From the perspective of metacognition, reading is viewed as a constructive process where the reader engages actively with the text. Since there is a need for more mobile assisted language learning (MALL) activities based on constructivist theories (Kukulska-Hulme & Shield, 2008), research on metacognition applied to reading skills is consonant with this study.

Research from reading and technology shows that the use of appropriate reading strategies for comprehending information in e-learning environments is crucial (Verezub & Wang, 2008). Technology can assist modelling metacognitive strategies, especially for foreign language learners. For example, activating background knowledge is more difficult when reading outside the classroom and technology can provide that background information (Mayer, 1997).

Research in foreign language and technology is useful in that it shows on the one hand, that there is an increasing use of digital material such as websites, podcasts, e-books for foreign language learning, and on the other hand, it shows that there is a need for evaluating digital content drawing on foreign language acquisition research (Chapelle, 2009).

It is important to begin with an understanding of how a particular language skill is learned (i.e. speaking, reading, listening and writing – see Section 1.1.2). In this way, we can consider how technology can best be utilised to support the learning of these skills (Chun, 2006). Thus, this chapter first reviews research on reading, which is the language skill under investigation in this study. Since reading processes are complex and involve diverse components (Chun, 2006), only the topics relevant in using MALL to support FL reading comprehension are discussed here. These include: models of reading, approaches to foreign language learning strategies, and strategy instruction. Since the concept of

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[3] Halliday and Hasan's (1980, p.1) definition of text is used: "…any passage, spoken or written, of whatever length, that does form a unified whole oral or written discourse".

comprehension is important in the reading process, a brief account of the concept of comprehension of a foreign language is also given.

2.1 Models[4] of reading and reading strategies

In order to understand reading strategies, it is first necessary to describe what is meant by the term reading. The reading process includes two components: 1) decoding skill and 2) language comprehension. Based on these components Elbro (2001/2006) defines reading:

> To read is to understand the content of written or printed texts; the reader creates a mental representation of the content on the basis of 1) the recognition of the words of the text, and 2) prior knowledge to the conceptual text world. (p. 29. MT[5])

In this definition, the concept of background knowledge is crucial in understanding the text. This is also the case in the models of reading to be presented in this section.

The use of strategies associated with the reading process has been explained by different reading models. In the following section, a brief account is given of models of reading that describe the use of strategies for reading comprehension (for a comprehensive review of models of reading see Tracey & Morrow, 2012).

Tracey and Morrow (2012) emphasise the importance of having multiple "lenses" (theoretical models) in researching literacy. The more lenses a teacher has the better she or he will understand reading processes and take informed decisions. Tracey and Morrow (2012) discuss how reading processes have been explained from different theoretical perspectives, such as behaviourist, constructivist, social

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[4] The terms "theory" and "model" have been used interchangeably in the reading literature (Tracey & Morrow, 2012). This thesis uses the terms that the authors of the theories presented have used when referring to their theories or models.

[5] "Læsning er at opfatte indholdet af skrevne eller trykte tekster, idet man genskaber et forestillingsindhold på basis af 1) identifikation af tekstens ord og 2) forhåndskendskab til tekstens begrebsverden".

constructivist and information processing cognitive theories. These reading theories and models influence classroom instruction and guide research (Tracey and Morrow, 2012). Ideally, researchers would interpret results from multiple perspectives in order to better understand reading processes. I agree with Tracey and Morrow (2012). In this study, I look at the reading process from two theoretical perspectives: cognitive-processing and constructivist[6]. Together they provide an explanation of important cognitive aspects of FL reading. The cognitive-processing frameworks describe the mental processes that take place while reading. Constructivist theories explain how readers construct messages from the text by actively engaging with it.

Research on foreign language reading is based on L1 reading (Urquhart & Weir, 1998). Before discussing FL reading, an account of the L1 reading comprehension theories and models will be given. The reading comprehension process involves three important factors: 1) background knowledge; 2) rhetorical structure, and 3) reading strategies (Thompson, 1987). Since this thesis focuses on reading strategies, in this section four models in which cognitive and metacognitive strategies play a role will be discussed:

1) The Interactive Model and the Construction-Integration Model —| Cognitive-processing theories |

2) Metacognitive theory and Schema theory —| Constructivist theories |

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[6] The terms constructivism and constructionism are sometimes employed inconsistently in the literature (Crotty, 1998/2013). In this thesis, I will use the distinction made by Crotty (1998/2013): "…to reserve the term *constructivism* for epistemological considerations focusing exclusively `the meaning-making activity of the individual mind´ and to use *constructionism* where the focus includes `the collective generation [and transmission] of meaning´ ". (p.58)

Understanding of these models provides a theoretical basis for selecting learning activities for teaching reading skills in the classroom (Tracey & Morrow, 2012).

2.1.1 Interactive Model

The Interactive Model of reading (Rumelhart, 1977) is a cognitive-processing model of the reading process. It has given rise to research on reading strategy use. Most psycholinguistic models of text comprehension distinguish between two levels of processing: lower-level linguistic processing and higher-level meaning-based processing (e.g., Brown, 1998). The former is known as bottom-up processing; the latter, as top-down processing. Bottom-up processing refers to the decoding of the linguistic information. It proceeds from letter recognition to word recognition, the syntax and finally, to the discourse level. Bottom-up processing is text-based whereas top-down processing is knowledge based. The reader's knowledge of the world is related to what he/she reads. Rumelhart (1977), a proponent of the interactive theory of reading, claims that language is processed simultaneously at different levels. Higher-level processes may interact with lower-level processes. Before the emergence of Rumelhart's Interactive Model, reading was considered a passive skill.

Researchers in the field of FL reading have applied the interactive model to reading in a foreign language. For example, Lee and VanPatten (1995/2003) propose an instructional approach to L2 reading drawing on Rumelhart's Interactive Model. In a study, Haastrup (1989) illustrates interactive processing via word guessing in the context of FL reading. She claims that inferencing plays an important role in the comprehension process. In order to guess the meaning of an utterance the learner draws on different sources of knowledge: knowledge of the world and context (top level), and knowledge of the language (bottom level). The bottom level has different levels: semantic, syntactic and morphological.

In her study, highly proficient students used interactive processing (both top-down and bottom-up) in order to guess the meaning of a word. In contrast, less advanced students only used the first linguistic level (orthographic), which was

not enough for guessing the word. She concludes that the use of only the bottom-level is not enough for the process of comprehension, but that the use of context and knowledge of the world (the top level) is essential for success in guessing. She also showed that comprehension is successful via top-down when there are no cues available at the bottom-level for word guessing.

The differences between highly proficient students and less advanced students in being successful in the comprehension process, i.e. guessing the meaning of the word, show that not all students make use of context when there is a comprehension problem. The strategy of inferencing can be taught (Nuttall, 2005). The implications in the classroom of the Interactive Model have been to teach strategies for reading both for bottom-up processing (e.g., decoding a word) and top-down processing (e.g., guessing a word with context clues).

One of the strengths of the Interactive Model is its comprehensiveness; another strength is that it can be applied to different readers in different reading contexts (Urquhart & Weir, 1998).

2.1.2 Construction-Integration Model

Research in text comprehension has been conducted both by linguists and by psychologists. Linguists have focused on the structure of the text and the linguistic structures, while psychologists have focused on the cognitive processes involved in text comprehension. Kintsch (1998) presents a theory of text comprehension that is addressed to both linguists and psychologists. He expands the Interactive Model by introducing strategies. Kintsch distinguishes between the *microstructure* and *macrostructure* of the text and between the *textbase* and the *situational model*. The microstructure is the structure of the text at a local level – exact words that appear in the text. The macrostructure is a set of propositions derived from the microstructure that represent the global structure of the text. A macrostructure is a "hypothesis about meaning" (Pressley & Afflerbach, 1995, p.39); other researchers (R.C. Anderson and Pearson, 1984) call these hypotheses "schemata". Kintsch's model focuses on comprehension. He claims that comprehension processes occur at different levels. The textbase is

composed of propositions derived from the text. However, understanding a text requires more than the textbase. Readers will interpret information presented in a text using their background knowledge. The situational model is the integration of ideas that appear in the text with prior knowledge and it is the process of deeply understanding the text.

Wiley, Griffin and Thiede (2005) suggest that the more complex an expository text is, the wider the difference between the text base and the situational model. In a simple text, there will be few implicit or causal relations implied by the text and the memory for the text and comprehension will not differ. In a complex text with more implicit relations, the situational model, which represents both explicit and implicit relations between ideas, will differ from the text base. Wiley et al. (2005) argue that with these kinds of text, the measures of comprehension are more reliable. Nevertheless, much research on text comprehension and metacomprehension has used simple texts. In this way, these studies have only measured the textbase level.

In order to form a representation of the meaning of a text, readers use strategies so that they move from the textbase to the situational model. The strategies identified in think-aloud protocols by Pressley and Afflerbach (1995) complement the Construction-Integration model since they offered a detailed description of strategy use (Afflerbach & Cho, 2010). For example, the strategies of focusing on the main parts of a text and linking this new information with prior knowledge to construct meaning reflect the processes of text comprehension included in the Construction-Integration Model (Afflerbach & Cho, 2010). The Construction-Integration Model can be used for studying how readers understand text in a second language with assistance of multimodal learning materials ("Model of Text Comprehension," n.d.).

2.1.3 Metacognitive Theory

Metacognitive Theory is a constructivist theory of the reading process. John Dewey was the pioneer of constructivism in America. From a constructivist

perspective, learning is the result of connecting new knowledge to existing knowledge.

Flavell and/or his colleague A.L. Brown[7] coined the concept of metacognition in the 1970s. It refers to "knowledge and cognition about cognitive phenomena" (Flavell, 1979, p.906). The term has been applied to different fields such as reading, writing, language acquisition, memory, attention, social interactions, self-instruction and education.

In Flavell's model of cognitive monitoring (1979), four components interact with each other: metacognitive knowledge, metacognitive experiences, cognitive goals and cognitive actions. He claims that in the monitoring of "cognitive enterprises", for example, reading a novel, the four elements interact with each other. Flavell defines metacognitive knowledge as children's or adults' world knowledge which is related to their cognitive tasks, goals, actions and experiences. An example would be a student's belief that he/she is better at understanding a novel than a newspaper article in a foreign language.

Metacognitive experiences are "any conscious or affective experiences that accompany and pertain to any intellectual enterprise" (Flavell, 1979, p.906), for example, the feeling that you do not understand a paragraph in a text you are reading. Goals denote objectives of the "cognitive enterprise". Actions or strategies denote "the cognitions or other behaviours employed to achieve them" (Flavell, 1979, p.907). Flavell (1979) maintains that metacognitive experiences can affect cognitive goals, metacognitive knowledge and cognitive actions. He goes on to explain that metacognitive experiences can trigger strategies, which aim at cognitive or metacognitive goals. He describes it as follows:

> As an example of the former, you sense (metacognitive experience) that you do not yet know a certain chapter in your text well enough to pass tomorrow's exam, so you read it through

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[7] In an interview conducted by Shaugnessy (2008), Flavell has stated that he is not sure whether it was him or his colleague A.L. Brown and Flavell that coined the term "metacognition"

once more (cognitive strategy, aimed at the straightforward cognitive goal of simply improving your knowledge). As an example of the latter, you wonder (metacognitive experience) if you understand the chapter well enough to pass tomorrow's exam, so you try to find out by asking yourself questions about it and noting how well you are able to answer them (metacognitive strategy, aimed at the metacognitive goal of assessing your knowledge, and thereby, of generating another metacognitive experience). (Flavell, 1979, p. 909)

In Flavell's model, the cognitive strategies are responsible for making cognitive progress and metacognitive strategies for monitoring it. Flavell (1979) argues that metacognitive knowledge may comprise knowledge of cognitive and metacognitive strategies. In an interview with Shaughnessy (2008), Flavell explains the type of metacognitive activities that teachers should foster: promoting self-reflection, monitoring, and regulation of their own activity. In foreign language learning research, Flavell's (1979) model has been used as the theoretical framework to investigate learners' metacognitive knowledge of language learning (Goh, 1998; Oxford, 2011; Wenden 1998).

Metacognition applied to reading

The concept of metacognition began to be applied to reading skill in the late 1970s by a group of researchers affiliated with the University of Illinois-Center for the Study of Reading. They began to explore the concept of metacognition in relation to reading skill. They were particularly interested in how they could train poor readers to use metacognition for improving their comprehension (Flavell, 1981). What the metacognitive theory adds to research on reading is that it explains how proficient readers mentally engage with the text during reading. Metacognitive theory applied to reading skills gave raise to awareness of reading strategies. Researchers adopting this framework have found that proficient readers use strategies to assist them in comprehension (VanKeer & Vanderlinde, 2010).

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Studies on reading and metacognition in the 1980s gave rise to the field of reading strategy research. A.L. Brown (1980) studied children's reading and metacognition. She defined reading strategies as "any deliberate planful control of activities that give birth to comprehension" (p. 456). Activities included in this definition are: setting a purpose for reading, paying attention to the task, identifying the main ideas in the text, monitoring comprehension, and taking action when understanding is not successful. A.L. Brown's research was mainly with children. Since then the field of reading strategies has been researched in other contexts (N.J. Anderson, 1991; Carrell, 1989; Macaro, 2001).

The reading process involves also thinking, writing and drawing (Mygind and Winding, 2003). It is an active process where the reader constructs meaning from the text. The importance of reading strategies comes from the fact that successful reading comprehension does not depend on just word recognition, understanding the sentences, and reading aloud, but also on other skills such as inference making, understanding text structure and comprehension monitoring (Oakhill and Yuill, 1996). Also from the fact that reading strategies are teachable (Oxford, 1990; Chamot 2004). The goal of metacognitive instruction is to help readers use these strategies independently (Tracey & Morrow, 2012). It also serves as a tool for guiding instruction as described in section 2.5. Central to metacognition theory is schema theory, which will be discussed in the next section.

2.1.4 Schema Theory

Schema theory is another constructivist perspective where activation of relevant schemata is crucial to the reading process (Urquhart and Weir, 1998). In order to acquire new knowledge, existing knowledge or schemata has an important role (R.C. Anderson, 2011). Readers possess both schemata for content (e.g. human beings, places, and things) and for reading processes (e.g. scanning, monitoring, and summarising) (R.C. Anderson and Pearson, 1984). R.C Anderson and Pearson (1984) argue that the reader's schemata in these domains influence reading comprehension. R.C Anderson, Hiebert, Scott, and Wilkinson's (1985) constructivist approach to reading argues for the need for instruction on reading strategies.

R. C. Anderson et al. (1985) advance five generalisations about reading, based on the assumption that the reader plays a main role in reading:

1. Reading is a constructive process: A constructive process means that the reader interprets a text using his/her background knowledge.

2. Reading is automatic: The automaticity of reading refers to the fast and accurate ability to recognise words.

3. Reading is strategic: R.C. Anderson et al.(1985) claim that reading is strategic. The reader can adapt his/her reading to different objectives (skimming for obtaining a general idea, rereading passages which were difficult to understand, etc.). The flexibility to adapt to different kind of readings of a given text depending on the objective to reach is a cognitive factor and this skill develops with age.

4. Reading is motivated: The reason for reading may come from curiosity, or from the need to handle information. In the classroom, Hauge (1999) suggests that the teacher can motivate students by explaining why the chosen text is important and meaningful to them and in this way make use of learners' metacognitive consciousness.

5. Reading improves all the time: reading is a skill so it is necessary to train it.

2.1.5 Summary: Models of reading and reading strategies

Four models of reading were presented in this section. Rumelhart's (1977) Interactive Model emphasises the importance of using information from multiple sources, syntactic, semantic, orthographic and lexical information during the reading process. Kintsch's (1998) Construction-Integration Model focuses on comprehension and not on decoding at the word level. Metacognitive theory emphasises the active construction of meaning by the reader during the reading process. Schema Theory (R.C Anderson and Pearson, 1984) includes the role of schema in the act of reading. It explains how new information interacts with existing knowledge structures and how schemata change across periods of time. It also emphasises the reader's engagement with the text in order to construct meaning.

These theories complement each other and inform both theory and practice related to reading strategies (see Table 1). For example, inferring is a strategy helpful in identifying a word. It uses context clues (top-down processes) to influence word recognition (bottom-up processes). The interaction between both levels to identify the word has a clear connection with the Interactive Model. Activating knowledge is a reading strategy that reflects both the Construction-Integration Model and Schema Theory. Finally, the metacognitive strategy of planning before reading is reflective of Metacognitive Theory.

Reading Model	Examples of reading strategies related to the model	Strategy description
Interactive Model	Making inferences	Guess the meaning of a word using knowledge of the world (top level) and knowledge of the language (bottom level)
Construction-Integration Model	Identifying the main points	Focus on the main parts of the text
	Activating background knowledge	Think about prior knowledge to help understanding
Metacognitive Theory	Planning Monitoring Evaluating	Preview the main ideas Reflect while reading Reflect on what you read

Schema Theory	Activating background knowledge	Think about prior knowledge to help understanding
	Setting a purpose for reading	Decide what their purpose for reading is (e.g. to perform a task, to learn new information)

Table 1. Reading models and related reading strategies

Another concept that is related to reading is comprehension. This will be discussed in the next section.

2.2 Foreign language comprehension

Even though there is much research in FL reading, what we know about reading processes from foreign language reading research in Denmark is based on L1 reading research (Hauge, 1999). Hauge (1999) suggests that research on FL reading should be reinforced in Denmark.

Eskey (2005) writes that even though the field of FL reading relies on L1 studies, research on L1 reading "provides a foundation for exploring both the similarities and differences between L1 and L2 reading" (p.564). Along the same lines, C.M Brown (1998) reviews L1 reading theories and suggests that L2 reading research has been significantly influenced by L1 reading research since the 1970s. Nevertheless, she thinks that it took a long time for these theories to integrate into L2 research.

Hauge (1999) describes the differences between L1 and FL reading. The first difference she points at is that in FL reading there is a language level threshold which the learner has to reach in order to succeed in L2 reading. The second difference is that when the student learns to read in the mother tongue he/she

already has other language skills, e.g. he/she can speak and listen with that language. The third difference is the cognitive development of the student. When children learn to read, their cognitive development stage is different to that of adults. R. C. Anderson et al. (1985) consider reading as a part of the child's general language development and should not be separated from the other language skills, namely, listening, speaking and writing. Other authors claim that the type of instruction that enhances a native speaker's comprehension is also effective for students learning English as a foreign language (Duke, Pressley, & Hilden, 2006).

Reading involves different processes, one of which is comprehension. The concept of comprehension may be viewed from two points of view: as a process and as a product (Hauge, 1999). In order to achieve comprehension, the reader has to reflect on what they are reading (Scarcella & Oxford, 1992). In the definition of comprehension by Harris and Hodges (1995) the reader has to go through one or all of the following comprehension levels:

a. drawing the literal meaning
b. understanding the underlying meaning
c. evaluating in a critical way what is read

Hauge (1999) states that these different levels of comprehension should be taken into account in the classroom when designing reading activities. Research has shown that good readers make use of top-down processing skills, such as inferring the meaning of unfamiliar words, phrases, and expressions through context, predicting what will come next, and activating prior knowledge (Macaro 2009; Boulware-Gooden et al., 2007). The use of bottom-up processing skills (e.g. textual decoding through word recognition, vocabulary knowledge and understanding sentence structure) alone is not enough for a complete understanding of the text. Reading activities should promote the use of strategies for solving the task (Hauge, 1999). In this way the reader will learn which strategies are more effective in a given situation.

Summary: Foreign language comprehension

From the section above, we can see that reading comprehension is a complex process in which a number of variables interact with one another. Research on reading has investigated both reader factors and text factors. In a foreign language, the reading process is different to that of reading in a first language, since the foreign language reader has not already mastered speaking in that language.

Another theoretical framework that guides this study is language learning strategies (LLS) – the field of language learning which gave rise to strategy learning. Before presenting cognitive and metacognitive reading strategies, the next section will discuss different models of FL learning strategies. In particular, the theoretical model for this study, the Strategic Self-Regulation (S²R) Model of language learning, and how the metacognitive and cognitive strategies in the model are applied to reading skills.

2.3 Approaches to foreign language learning strategies

It does not come as a surprise that the interest in learning strategies has grown since the 1990s. According to Dryden and Vos (2001), since we do not know what kind of knowledge students will need in the future, the key to change in education is that students learn how to learn. Along the same lines, psychologist Herbert Gerjuoy states that:

> The new education must teach the individual how to classify and reclassify information, how to evaluate its veracity, how to change categories when necessary, how to move from the concrete to the abstract and back, how to look at problems from a new direction — how to teach himself. Tomorrow's illiterate will not be the man who can't read; he will be the man who has not learned how to learn. (as cited in Toffler, 1970, p. 367)

This idea has been expressed before. In fact, it is at the core of Dewey's educational theory: "the aim of education is to enable individuals to continue their education" (Dewey, 1916/1966, p 100).

The terminology in the literature of learning strategy research is variable and it is normal to encounter the following terms: "strategies", "learning strategies", "language learning strategies", and "language learner strategies". In a study of strategy use in foreign language reading, Pritchard (1990) defines strategy as "a deliberate action that readers take voluntarily to develop an understanding of what they read" (p.275). Learning strategies (LS) have roots in the field of educational psychology. Mayer (1988) defined LS as "behaviors of a learner that are intended to influence how the learner processes information" (p.11). Wenden (1987) employs the term "learner strategy" which refers to "language learning behaviors learners actually engage in to learn and regulate the learning of a second language" (p.6). The term also includes learners' strategic knowledge and their knowledge about the personal factors that assist L2 learning. Finally, Oxford (1990, 2011) uses "language learning strategies" or L2 learning strategies. The next section argues for using Oxford's model as a theoretical framework; therefore this study uses Oxford's definition:

> self-regulated L2 learning strategies are defined as deliberate,
> goal-directed attempts to manage and control efforts to learn the
> L2 (Oxford, 2011, p.12).

Regarding the choice between "learning" and "learner" in the term "learning strategies" or "learner strategies", Oxford argues that her model places the emphasis on strategies for learning and that most learning researchers use this term (Oxford, 2011, p.13).

The definition of strategy has been criticised on the grounds that it is difficult to link the cognitive process with external behaviours (Grenfell & Macaro, 2007). Along the same lines, Seliger (1983) doubts the assumption that what the learners express is a representation of their "internal reality" (p.180). Grenfell and Macaro (2007) claim that strategies are a type of activity that the learner uses

when problems occur. They go on to say that the type of problem may be related to the discourse, to the social context or to the learner. Therefore, the relationship between the psychological aspect and the social is a   better explanation for strategy behaviour.

There are few published critiques of language learning strategies (Grenfell & Macaro, 2007). The issues raised by a few scholars are addressed by strategy models that use the concept of metacognition. As Grenfell and Macaro (2007) puts it: "There is a growing consensus that is in the combination of strategies selected for a task and their orchestration through metacognition that sophistication lies" (Grenfell & Macaro, 2007).

In the field of language learning strategies (LLS), considering the extensive amount of bibliography and research (see Oxford, 2011, and Griffiths, 2008 for a comprehensive review) one could be inclined to believe that this field has a long history. However, research in this field started only in the mid-nineteen-seventies with the pioneer work of Rubin (1975) and Stern (1975). They observed good language learners and identified a range of strategies that characterised them.

Since then, researchers within the field, such as O'Malley and Chamot (1990), Oxford (1990), Wenden (1991) and A.D. Cohen (2011), have categorised FL learning strategies in various ways. A systematic classification is of great importance to research on learning strategies since it contributes to an understanding of the various and complex factors operating simultaneously in the learning process (Tornberg, 1997/2003, p.23).

Research on language learning strategies has drawn on second language acquisition (SLA) and on cognitive psychology (Chamot, O'Malley, Kupper, & Impink-Hernandez 1987). It was Chamot et al. (1987) who first applied an information-processing model from cognitive theory to the field of language learning strategies. They used J.R. Anderson's (1983) ACT model (Adaptive Control of Thought), which proposes three types of memory: a working memory and two types of long-term memories (LTMs). According to J.R. Anderson, the two types of LTMs store two different kinds of knowledge: the declarative

knowledge (know that) and procedural knowledge (know how). In the process of acquiring a language, moving from declarative knowledge to procedural knowledge proceeds in three stages: a) a cognitive stage, where learning is rule-based; b) an associative stage, where the learner execute actions faster; and c) an autonomous stage, where the learner performs more fluently and the original rules that controlled language production may be lost.

Applying the ACT model, Chamot et al. (1987) view the process of learning language learning strategies in the same way as learning other complex cognitive skills (Mitchell & Myles, 1998/2002). Other learning strategy researchers, such as Cohen (2011), have also employed the cognitive psychology and information processing framework to explain the role of strategy behaviour.

Because of this need to provide a theoretical foundation to guide research, more theories of learning and language learning began to guide the explanation of the development of learning strategies. In the 1990s, Vygotsky's (1978) learning theories played a role in the domain of second language learning. His ideas were taken up by FL learning strategy researchers. For example, Donato and McCormick (1994) investigated the role of learning strategies from the perspective of Activity Theory (Leontiev, 1981), to which Vygotsky' ideas contributed. A different learning concept is expressed by Wenden's model (1991), which uses the construct of metacognition inspired by Flavell (1979). Wenden's model focuses on individual cognitive processes and assigns an active role to the learner.

The following section argues for the choice of the Strategic Self-Regulation (S²R) Model of language learning as a theoretical framework among the other strategy models.

2.3.1 The Strategic Self-Regulation (S²R) Model of language learning

Chamot et al. (1987) explain the role of learning strategies within a cognitive view of learning. Oxford's (2011) S²R Model differs from Chamot et al.'s model and other taxonomies in that the S²R model includes the concept of metastrategies

(see Figure 2), which "reflects the multidimensional reality of the L2 learner" (Oxford, 2011, p.17). Oxford's classification also differs from other models in that the strategies are categorised in two groups: *direct strategies* that involve using the new language and *indirect strategies* that involve learning the language (Oxford, 1990).
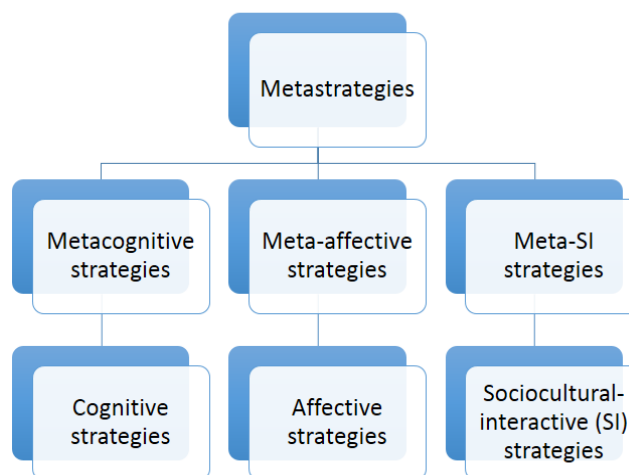
Figure 2 Metastrategies and strategies in the S²R Model.
Source: Oxford (2011, p. 17).

The S²R Model is based on more than 30 years of research. In the 1990s, Rebecca Oxford was already a well-established researcher in the field. Her previous model of learning strategies (Oxford, 1990) was considered the most complete at that time. As Ellis put it, it was "perhaps the most comprehensive classification of learning strategies to date" (Ellis, 1994, p.539).

In a review, Hsiao and Oxford (2002) compared classification theories of language learning strategies. From all the models, Oxford's (1990) 6-factor strategy taxonomy, which was Oxford's initial classification system, was the most consistent with learners' strategy use (Hsiao and Oxford, 2002). A more recent version of the 6-factor strategy taxonomy is the S²R Model (Oxford, 2011). Therefore, I have chosen this model, rather than other well-known theoretical

models such as Macaro's (2006), O'Malley and Chamot's (1990) and Wenden's (1998).

Moreover, the S²R model draws from a number of Vygotskian ideas, such as self-regulation and the role of scaffolding. Self-regulation is a single aspect of metacognition (Hemmye, 2004). When applied to learning, Schunk & Ertmer define self-regulation as:

> … such processes as setting goals for learning, attending to and concentrating on instruction, using effective strategies to organize, code and rehearse information to be remembered, establishing a productive work environment, using resources effectively, monitoring performance, managing time effectively, seeking assistance when needed, holding positives beliefs about one's capabilities, the value of learning, the factors influencing learning and the anticipated outcomes of actions, and experiencing pride and satisfaction with one's efforts. (Schunk & Ertmer, 2000, p.631)

Hammond and Gibbons (2001) define scaffolding as:

> teacher assistance and support that is designed to help learners move towards new skills, concepts or understandings. But it is also assistance that is designed to help learners to work with increasing independence to know not only what to think and do, but how to think and do, so that new skills and understandings can be applied in new contexts. (p.16)

This definition also includes the notion of the gradually removal of support. While scaffolds are valuable for helping the student, the initial definition of scaffolding (Bruner, 1983) also included the notion of gradually removing the scaffolds, which is often missing in educational scaffolding (G. Conole, personal communication, June 26, 2013).

It can be argued that language-learning strategies can be better understood with Oxford's model, since it is more holistic. It examines the socio-cognitive-affective dimensions of learning strategies from a Vygotskian point of view. Within Oxford's model it is assumed that learning strategies are learnt through mediation. Knowledge construction is assisted through dialogue between someone knowledgeable, such as a teacher, and the learner. Oxford points out that in the classroom the teacher can mediate students' strategy learning; but when learning takes place outside of the classroom, strategies are learnt with mediation from cultural tools: language, books, technology (Oxford, 2011, p.27).

However, Oxford's work does not clarify in which way technology can mediate student's strategy learning. In this thesis, I will argue for the use of technology as a tool for mediating strategy learning, and how this may be achieved. It can be argued that the S²R Model can better explain the learning process with new technologies, since one important characteristic of these tools is the possibility of interaction and collaboration (Auer, 2015b).
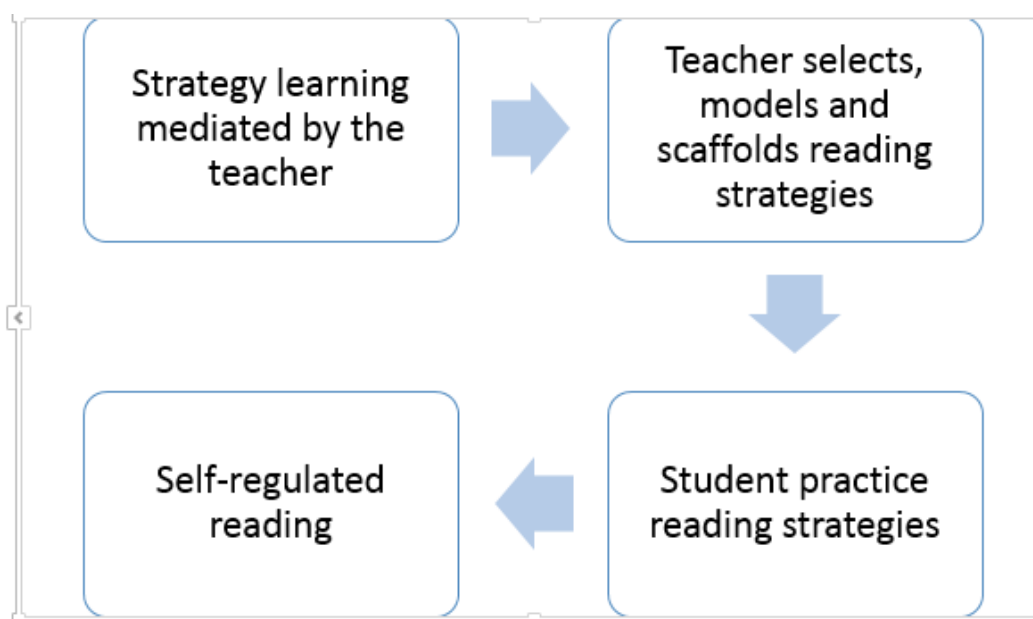
Figure 3. The S²R Model: The teacher as mediator

The aim of strategy learning is to help students become more aware of how they can enhance their own FL comprehension, so they can self-direct the process of

reading. Whether strategy learning is mediated by the teacher or the technology has an influence in both the role of the teacher and the student. In the classroom (see Figure 3), the role of the teacher is to act as a metacognitive coach by servings as a model, thinking aloud with the students (modelling reading strategies), providing practice and encouraging students to experiment with a broad range of reading strategies. The teacher as a coach will work with the learners to develop their reading strategies. The teacher provides the appropriate scaffolding so students can improve their self-regulation. Students gradually start to take more responsibility for their learning. With the teacher scaffolding, students can begin to develop their agency in order to achieve learner autonomy. In this self-regulated learning process, students can move from being teacher-dependent to more autonomous.

The S²R Model includes strategies for three dimensions of L2 learning: cognitive, affective and sociocultural-interactive. In this model, cognitive strategies facilitate both learners' L2 knowledge construction and the application of L2 knowledge. Affective strategies support learners in coping with their feelings and attitudes, helping them to stay motivated. Sociocultural-Interactive (SI) strategies help learners deal with communication, sociocultural contexts, and identity. These strategies are coordinated by metastrategies, such as planning, monitoring and evaluating. Thus, Oxford's model includes three types of metastrategies: metacognitive strategies, meta-affective strategies and meta-SI strategies. Figure 2 shows metastrategies and strategies in the S²R Model.

Oxford (2011) distinguishes between surface and deep processing strategies. Surface strategies "help learners memorize material in order to repeat it when necessary, but without a goal of learning" (p.30). She states that the cognitive and metacognitive strategies in the S²R Model are *deep processing strategies* and that they assist understanding, enhance meaningful mental associations and are the most effective for long-term retention.

The cognitive dimension of L2 learning in the S²R Model is the focus of this thesis. This study examines language learning strategies for a specific FL area, namely reading. The theories of reading presented in section 2.1 involve cognitive and

metacognitive strategies. Chun, (2006) describes the significance of cognitive processes in reading. Moreover, cognitive and metacognitive strategies in the S²R Model fit well with the Metacognitive theory idea of readers involved in a constructive process to extract meaning from the text. It also fits with Flavell's (1979) concept of metacognitive knowledge (knowledge of cognitive and metacognitive strategies). Finally, viewing reading from the metacognitive perspective, N.J. Anderson (2005) hypothesises that metacognitive strategies are the most important because if the student is able to regulate his/her learning using the appropriate strategies, language acquisition will be faster.

The S²R Model includes not only strategies but tactics as well. Tactics are "the specific manifestations of a strategy or metastrategy by a particular learner in a given setting for a certain purpose" (Oxford, 2001, p.31). Oxford (2011) asserts that L2 learners use a strategic-tactic chain, which is "a set of organized, sequential or interlocking strategies manifested in a given situation by specific tactics" (Oxford, 2011, p.34). She goes on to say that "changing conditions cause changes in how an action (strategy) is implemented" (p.54).

The S²R Model describes 3 phases for solving a task: 1) strategic forethought, 2) strategic performance and 3) strategic reflection and evaluation. Some strategies are more useful in a particular phase. For example, planning is useful in Phase 1. According to Oxford (2011), learners do not always follow a linear sequence, and the same strategy may appear in more than one phase. She concludes that this way of adjusting strategies is at the core of self-regulation (Oxford, 2011, p. 26).

2.4 Cognitive and metacognitive reading strategies

Grenfell and Macaro (2007) discuss two important shifts in the history of LLS. One is from the initial conception of the 'good versus bad' language learner towards "an individual's strategic reaction to a contextualised task or series of tasks" (p.23). In this shift, LLS research began to focus on the strategies students use to accomplish a particular task, for example a reading task. The second shift

is a move to a qualitative account on strategy use rather than a quantitative one. These two shifts are responsible for a gradual focus on metacognition that enables learners to combine strategies effectively (Grenfell and Macaro, 2007). The concept is important because it will be the lens for looking at reading strategies and addressing the criticism on strategy research.

The strategies in the S²R Model can be applied to the four language skills: listening, reading, speaking and writing (see Cohen, 2011 and Oxford, 2011 for a comprehensive review of strategies applied to these skills). In reading, some examples of the application of the cognitive strategy of conceptualising with details are: the use of preview questions, analysing expressions in the new language and using linguistic knowledge. Identifying the requirements and the purpose of the reading task before reading is an example of planning for cognition – a metacognitive strategy. There is a large body of research on which strategies are most appropriate to each of the language skills (Oxford, 2011). In the S²R model, some strategies are more appropriate to certain language skills than others. Oxford (1990) proposes how these strategies can be used to develop each of the four language skills. Since the focus of this study is on reading skills, Oxford's (1990; 2011) suggestions of how cognitive and metacognitive strategies can be applied to reading skill are now presented.

2.4.1 Cognitive reading strategies

Within the cognitive dimension, two types of learning strategies can be distinguished: cognitive and metacognitive strategies. Even though Oxford (2011) distinguishes cognitive and metacognitive strategies clearly, caution has to be taken since there is not a clear-cut distinction between metacognitive and cognitive strategies (Urquhart and Weir, 1998).

Cognitive strategies support the learner in constructing and applying L2 knowledge. The S²R Model includes six cognitive strategies (Oxford, 2011, p.46):
- Using the Senses to Understand and Remember[8]

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[8] Oxford (2011) capitalises the names of the strategies because they belong to the model

- Activating Knowledge

- Reasoning

- Conceptualising with Details

- Conceptualising Broadly

- Going Beyond the Immediate Data

In foreign language learning, cognitive strategies "aid the learner in putting together, consolidating, elaborating, and transforming knowledge of the language and culture" (Oxford, 2011, p.46). In the following, I present Oxford's (1990; 2011) suggestions of how cognitive strategies can be applied to reading skills.

Using the Senses to Understand and Remember

When reading, students can apply imagery to remember what has been read by creating a mental image. For example, when meeting the new words "she combs her hair" the student can picture him/herself combing his/her hair. Imagery in reading also has value in remembering a written item. The student can picture the place where the text is located. Mangen, Bente, & Brønnick (2013) comment that the ability of locating a particular passage in a book, by remembering where in the text it appeared, is altered by reading onscreen.

Students can represent sounds in memory; making auditory representations of sounds helps students to remember. Students can link the new word with known words from any language. For example, Corinna links the Danish expression "Tak skal du have" with the Spanish phrase "tasca dejé" which has a similar sound.

Another valuable strategy is using the haptic sense to understand and remember. Students can act out a new expression that has been read. For example, if a student meets the English word "nod", they can nod their head in order to remember the word in English.

Finally, students can use use tables, figures, and pictures in the digital text to increase their understanding.

Activating Knowledge

This strategy is related to Schema Theory (R.C.Anderson et al., 1985) and the Construction-Integration Model (Kintsch, 1998). Students can get an overview of the reading material's content and link to prior knowledge. Activating the appropriate schemata can facilitate FL reading comprehension (Lee & VanPatten, 1995/2003). For instance, if the story to be read is about the use of technology in Mexico, it is helpful to consider what type of technology is used in one's own country and how it is used.

Reasoning

This strategy is useful for making hypotheses about the meaning of the text with the help of general rules the learner already knows. It can also be inductive. For example, a Spanish student can try to figure out the grammar rules for the use of "bueno" (good) and "bien" (well) in Spanish based on examples from a short text.

Conceptualising with Details

A way of using this strategy in reading is using preview questions, analysing expressions in the new language, looking for similarities and differences with other languages or using linguistic knowledge. For example, in order to guess the meaning of an unfamiliar word or expression students can try to analyse it using knowledge of the meanings of its component parts. For instance, the word "polymorphous" consist of the prefix "poly-" which means "many" and the stem "morph-" meaning "form". Comparing across languages enable students to analyse words and compare them with their mother tongue. Translating can support comprehension but word-for-word translation can give an inaccurate translation (Oxford, 1990).

Decoding every letter in each word in order to understand reflects the strategy of Conceptualising with Details. It is a bottom-up strategy in the Interactive Theory (Rumelhart, 1977) and it also corresponds to the text level in the Construction-Integration Model (Kintsch, 1998).

Conceptualising with Details also includes making hierarchies of ideas, which is useful in developing schemata since it helps students to link new knowledge with prior knowledge (Oxford, 2011). Ways of employing this strategy include categorising, highlighting, and taking notes. Highlighting involves emphasising the major points, categorising and grouping new words; in this way students process the new information and it is easier to remember.

There is critique as to whether digital notes hinders reflection (Mueller & Oppenheimer, 2014). A possible explanation for why the students in the Mueller and Oppenheimer (2014) study did not reflect is that they had not learnt to focus on getting the main idea and reflecting, so they simply took the notes verbatim. In an interview in a magazine article (Romme, 2014), Natalia Auer argued that students should learn how to take notes whether on paper or digital media, since it might not be the medium that hinders reflection but lack of instruction on how to synthesise ideas and write them down.

Conceptualising Broadly

In reading, this strategy can be used by skimming a text quickly for gist. Skimming is used when the reading purpose is to obtain the main idea of the text (Pastor Cesteros, 2004). Skimming represents using top-down level processes in the Interactive Model (Rumelhart, 1977). Therefore, successful skimming depends on L2 readers knowledge either of the topic of the text or of the structure or both (Urquhart and Weir, 1998).

Students can also create a semantic map for enhancing comprehension of new expressions. They can apply this strategy before reading so they will better understand the new vocabulary in the text they will read. It is important to learn concepts in order to understand a text. Using pictures, graphs, charts, tables and other textual aids is also valuable for learning abstract academic concepts and in this way improves reading comprehension (Cummings, 1984).

Going beyond the Immediate Data

Two strategies for going beyond the immediate data are predicting and inferring the information when reading. Predicting is a strategy where the reader anticipates the content of the text. By anticipating the content of a text the reader establishes a macrostructure for the text (Kintsch, 1998) and this is an aid to more detailed comprehension. It should also promote the readers interaction with the text (Urquhart and Weir, 1998).

Inferring involves using linguistic clues such as knowledge of the language being learnt, the learners' mother tongue, or some other language, to understand the text. Linguistic clues such as suffixes, prefixes, and word order are useful for guessing meanings. It is also important to use other non-linguistic clues such as forms of address, text structure, description of people, identification of the situation, general background knowledge, graphs, pictures and tables, which can help students to get an idea of the meaning. Inferring word meanings improves retention because it increases deeper processing (Grace, 1998). Lee and Wolf (1997) investigated strategies used by native and non-native readers for inferring word meaning in a Spanish text. An interesting result was that within each proficiency level examined, the use of the inferencing strategy was achieved in different ways.

This section has described how the cognitive strategies, as defined by Oxford (2011), are applied to reading skill. Table 2 provides a summary of the section.

Cognitive Strategies (Oxford, 2011)	Cognitive strategies applied to reading skill
Using the Senses to Understand and Remember	Using tables, figures, and pictures in the digital text to increase understanding Creating a mental image to help remembering Reading aloud to help understanding Acting out words to help remembering
Activating Knowledge	Thinking about prior knowledge to help understanding Using new information to clarify or modify prior knowledge

Reasoning	Figuring out a rule Applying a rule
Conceptualising with Details	Identifying the main points Taking notes, underlining and highlighting to organise the information Decoding letter by letter, word by word, to help understanding Applying linguistic knowledge of other languages to the target language
Conceptualising Broadly	Skimming the text before reading it to get the gist of what it is about Creating a mental, oral or written summary of information to get the main idea Using typographical features like bold face and italics to identify key information
Going Beyond the Immediate Data	Making predictions while reading Using context clues to help understanding

Table 2. Cognitive strategies in the S²R Model applied to reading skill

2.4.2 Metacognitive reading strategies

The use of cognitive strategies is not enough for successful reading. Cognition must be guided by metacognition (Eskey, 2005, p. 576). Effective readers engage actively with the text by using metacognitive skills to monitor and regulate their comprehension processes (Woolley, 2011). Metacognitive strategies "manage cognitive aspects of L2 learning" (Oxford, 2011, p.45).

Mygind and Winding (2003) classify the strategies as those that can be used before reading, while reading, and after reading, arguing that, since there are many strategies, they should not be used at the same time. Mygind and Winding's (2003) arguments are faulty because activities before reading, during reading and after reading are based on the concept of metacognition, not on the unmanageable quantity of strategies. Moreover, metacognitive processes are not linear; they may occur at the same time when accomplishing a reading task (N.J. Anderson, 2002). Other researchers have categorised metacognitive strategies in different ways (O'Malley & Chamot, 1990; Oxford, 1990; Wenden, 1991) but

most agree on the following: planning, monitoring, and evaluating. In the field of reading, it was O'Malley and Chamot (1994) that coined the strategies found in N.J. Anderson's study (1991) as metacognitive.

The metacognitive strategies in the S²R model (Oxford, 2011, p.145) are:

- Paying Attention to Cognition
- Planning for Cognition
- Obtaining and Using Resources for Cognition
- Organising for Cognition
- Implementing Plans for Cognition
- Orchestrating Cognitive Strategy Use
- Monitoring Cognition
- Evaluating Cognition

Paying Attention to Cognition

The strategy of Paying Attention to Cognition helps with developing schemata and assists learners to focus (Oxford, 2011). Students can try to notice particular details when reading. For example, a student can pay close attention to the Spanish features "Usted" "Ustedes" (used in Spanish for addressing people politely; it means "You") so he/she can appropriately address Spanish people of different ages.

Planning for Cognition

Strategic readers plan their reading task (Sheorey and Mokhtari, 2001). This strategy assist students in identifying the requirements and the purpose of the reading task before reading. Awareness of the reading purpose is a characteristic of good reader. By using knowledge of their purpose they can direct their efforts in a more effective way (Pressley & Afflerbach, 1995). Moreover, understanding of the structure of the text can support reading comprehension (Urquhart & Weir, 1998). Strategic readers plan how to approach their reading depending on the material – they preview the text first by noting its characteristics, such as length and organisation (Pressley & Afflerbach, 1995).

Obtaining Resources for Cognition

This strategy helps students understand what is read by using printed resources such as dictionaries, word lists, grammar books and non-print resources, which include TV, videocassettes, radio, and museums.

Nuttal (2005) discourages students from consulting dictionaries on the grounds that it interrupts thinking and it decreases reading speed. She suggests using another strategy, inferring, when students meet an unknown word in a text. Along the same lines, Auerbach and Paxton (1997) found that FL beginner readers feel they need to know every word in the text in order to understand the text instead of compensating for their lack of knowledge in the foreign language with other reading strategies.

Organising for Cognition

This strategy helps students to organise the environment to read as well as organising the materials. Given that the external and internal reading environment plays an important role for reading effectively (Elbro & Nielsen, 1996), an application of this strategy to reading is to consider the physical reading environment, such as chair, table, light, the temperature, etc.

The strategy of Organising for Cognition can also assist students with the internal environment or psychological conditions. For example, Elbro and Nielsen, (1996) recommend splitting the course material in small parts.

Implementing Plans for Cognition

This strategy involves thinking about a plan and executing that plan. For example, a student can remember about his/her plan about taking notes of every unknown word each time as he/she reads a short story. Then, while reading he/she takes notes of every unknown word in the short story.

Orchestrating Cognitive Strategy Use

The strategy of Orchestrating Cognitive Use helps students to think about which strategy is most appropriate to a particular task. When applied to reading skill, Oxford argues that the reader must know how to use a strategy for a particular purpose and coordinate its use with other strategies. As N.J. Anderson (1991) puts it: "it is not sufficient to know about strategies; a reader must also be able to apply them strategically" (p.469).

Monitoring Cognition

This strategy is related to Schema Theory: a reader can check their comprehension by asking whether it matches with their prior knowledge (Urquhart and Weir, 1998). Monitoring Cognition is one of the most extensively researched metacognitive strategies (Oxford, 2011). Perfetti et al. (2005) believe that poor readers do not monitor their comprehension. With reading skill, monitoring helps students check whether they have understood the text.

Evaluating Cognition

The strategy of Evaluating Cognition can be employed in different ways: evaluating cognitive strategy use and evaluating performance. After completing a reading task, students can reflect on their use of reading strategies and they can assess how effective their reading strategies have been. Research in text comprehension has shown that increasing students' awareness of reading strategies assists them in improving reading comprehension (Mokhtari & Sheorey, 2002). This awareness of reading strategies distinguishes the skilled from the unskilled readers (Pressley & Afflerbach, 1995).

Evaluating performance might consist of students assessing what proportion of a text they understand and whether this represents progression in their reading skill (Oxford, 1990). For example writing a summary is one way to check understanding of the text (Arnbak , 2003).

Summary

This section has presented how the metacognitive strategies as defined by Oxford (2011) are applied to reading skill. Table 3 provides a summary of the section.

Metacognitive strategies (Oxford, 2011)	Metacognitive strategies applied to reading skill
Paying Attention to Cognition	Focusing on specific structures or ideas
Planning for Cognition	Setting a purpose before reading Previewing the text by noting its characteristics like length and organisation
Obtaining Resources for Cognition	Using reference materials (e.g. a digital dictionary or the internet) to help understanding
Organising for Cognition	Organising reading material and the reading environment
Implementing Plans for Cognition	Remembering the plan to take notes while reading
Orchestrating Cognitive Strategy use	Considering which reading strategies to use for what purposes
Monitoring Cognition	Checking understanding when coming across new information Checking to see if the guesses about the text are right or wrong Re-reading the text to increase understanding
Evaluating Cognition	Assessing how well it accomplished the reading task Deciding how effective the reading strategies were Doing a judgement on learning: what did I learn?

Table 3. Metacognitive strategies in the S²R Model applied to reading skill

2.5 Strategy Instruction

Studies on metacognitive awareness of reading strategies have encouraged researchers to investigate whether teaching metacognitive strategies used by good readers are effective (Tracey & Morrow, 2012). When the training materials for strategy instruction are not integrated with language tasks, it might demotivate students (Oxford, 1990). Therefore, the most effective strategy instruction is integrated into regular L2 teaching (Oxford & Schramm, 2007).

In a presentation on strategy instruction, Oxford (2006, as cited in Oxford & Schramm, 2007) recommends:

- teaching strategies relevant for a L2 task and students' needs
- employing strategy names that are easy to recall
- showing how to use the appropriate strategy for a specific language task
- asking students what strategies are effective for them
- encouraging students to share their experiences with strategies for particular language tasks
- blending strategy instruction with regular language teaching
- emphasising to students that strategies can be transferred to a new language activity

In a comprehensive discussion on strategy instruction, Cohen (2011, ch.4) also considers the possible roles that teachers can play. Cohen argues for a shift in the teachers' role where they are the facilitator, and students become more independent and responsible for their own learning. What is important to notice here is that Cohen takes into account the concept of "fading", or removing scaffolds – discussed in the section above – since he sees the teacher's role as one of progressive withdrawal so students are not left in a dependent state.

2.6 Foreign language reading strategy research

Since there are similarities in the reading process between traditional print texts and reading in the digital environment, we should incorporate knowledge of reading strategies for traditional (i.e. print) texts for addressing the challenges

that digital reading poses (Afflerbach & Cho, 2010). Thus, this section reviews studies conducted with traditional print texts.

2.6.1 Print reading

Research has been conducted on the use of specific strategies in each of the four language skill areas, but the most researched skill area has been FL reading (Oxford, 2011). In the field of FL reading strategies, research has focused on different areas. In a review, Erler and Finkbeiner (2007) identify three main areas: strategy type and impact on reading proficiency; linguistic and non-linguistic factors that affect L1 and L2 reading strategies; and reading strategy instruction. Since the focus of this study is on the cognitive dimension of the S²R Model, namely the cognitive and metacognitive strategies, this review is on cognitive and metacognitive reading strategies and their relationship to reading comprehension.

Chamot et.al (1987) concludes in a study with Spanish and Russian students that the use of strategies does not depend on the language under study. Even though scholars have not yet come to a consensus as to whether reading processes are general, or specific to the different languages (Erler and Finkbeiner, 2007), this thesis assumes that they are.

In the field of foreign language learning, there is a large amount of research (N.J. Anderson, 1991; Auerbach & Paxton, 1997; Sheorey & Mokhtari, 2001) on the use of reading strategies for English as a second language. The results of these studies have inspired research on other languages and in those there is also a positive relationship between the use of reading strategies and successful reading comprehension.

The role of regulation in reading is paramount for developing reading comprehension (Nuttall, 2005). If the reader does not know that he/she has not understood then he/she will not be able to repair the problem in comprehension (Carrell, Gajdusek, & Wise, 1998). Looking at FL reading from a metacognitive perspective, the Sheorey and Mokhtari (2001) and Mokhtari and Sheorey (2002)

studies are representative. There seems to be a positive relationship between metacognitive awareness of reading strategies and foreign language reading ability (Sheorey & Mokhtari, 2001). Raising students' awareness of the various cognitive and metacognitive strategies that they can use for reading will enable them to choose the appropriate strategies for better comprehension. There is general agreement that awareness of reading strategies is important for strategic reading. Auerbach and Paxton (1997) reported that one student thought she had to understand every single word in order to read in a foreign language; she only relied on the dictionary as a resource for cognition, and not on other reading strategies.

Ahmadi, Ismail and Abdullah (2013) also argue for the central role of metacognitive reading strategy awareness in reading comprehension and complain that metacognitive reading strategy has been neglected in English teaching and learning (Ahmadi et al. 2013). Metacognitive strategies are the most important of all learning strategies because when the learner is able to control her/his own learning, the process of learning a foreign language becomes easier (R.C. Anderson, 2011). Along the same lines, Oxford (1990) argues that metacognitive strategies are crucial to language learning and that learners need to learn about metacognitive strategies in depth. In a study, O'Malley, Chamot, Stewner-Manzanares, Kupper, & Russo (1985) show that students employ less metacognitive strategies than cognitive strategies. In addition, their repertoire is limited; for example, learners used more planning strategies than evaluating strategies. Perfetti et al (2005) tell us why students do not use a metacognitive strategy – monitoring. Chamot et al. (1987) correlated language level with the use of metacognitive strategies. This could be an explanation for the fact that in some studies metacognitive strategies are not used; maybe those studies did not take into account the students' language level. Another explanation could be the learning context. Riley y Harsch (1999) and Karbalaei (2010) compared two different contexts, second language (SL) and foreign language (FL), and found that the use of strategies depended on the environment. SL students used more metacognitive strategies than FL students, while FL students used more cognitive strategies.

An interesting point in FL reading strategy research is that students need to know more than which strategies are useful – they also need to know how to apply them and coordinate their use with other strategies (N.J. Anderson, 1991). Along the same lines, Tornberg (1997/2003) concludes that we can help students by raising awareness of what strategies they can apply to different tasks. In a study, Sarig (1987) argues that individual differences influence the choice and combination of strategies. There are many possible variables which are due to individual differences and which influence the choice and combination of strategies when reading in a FL.

Metacognitive and cognitive reading strategies in foreign language learning have been predominantly studied with conventionally produced texts. Therefore, the question of how students use reading strategies with mobile technology to understand a foreign language seems relatively unexplored. The next section reviews the use of reading strategies when reading digital material.

2.7. Digital reading

Research has shown the importance of using metacognitive strategies in formal instruction (Oxford 1990) and in distance foreign language learning (White, 1995). These strategies are also crucial in comprehending digital reading material (Verezub & Wang, 2008). This section reviews the research that has investigated how technology has been employed to assist specific reading processes in L1 and L2 in particular, with computer technology and mobile devices.

2.7.1 Computer Technology in Reading

In a review of the "short story" (since 1966) of using computer technology in reading, Kamil, Intrator and Kim (2000) point out that research on technology and reading from 1990 to 1995 is not very large. Only 3 articles out of 256 dealing with technology were published in the two reading journals (Reading Research Quaterly and Journal of Literacy Research). In addition, the outcome measure used in research undertaken by the literacy community is learning or comprehension, whereas the outcome measure used by the IT community is time (Leu, 2000). In this way it is difficult to reach a consensus on the effects of using

computer technology in reading. Kamil et al. (2000) also mention that there are a few studies on hypertext and hypermedia and the cognitive consequences of these types of texts. They claim that there is no general agreement in research on technology and reading to allow these studies to be integrated successfully in reading instruction. They conclude that it is urgent to "determine how best to teach students to read the sorts of materials they may encounter" (p.774).

Due to the entrance of CD-ROM materials into the classroom in the 1990s, several studies have been conducted in order to determine the effectiveness of this medium on reading comprehension. For example, Greenlee-More and Smith (1994) compare the effect of electronic CD-ROM storybooks with paper storybooks on reading comprehension. The results show that there were only differences between groups in the longer and difficult texts. With regard to the design of the study, Kim (2002) argues that the comprehension test used in this study included only six multiple-choice comprehension questions and in this way reading comprehension measures may not be reliable.

The question of how to make reading comprehension more effective by using computer technology to teach reading strategies is raised in a study by Lange, McCarty, Normann and Upchurch (1999). The group who received reading instruction that integrated reading strategies with computer technology improved both in overall reading scores and specific reading skills.

Regarding FL reading, the history of research in the use of computer technology and FL reading is very short – it began only three decades ago. Research (Aweiss, 1995; Chun & Plass, 1996; Kleinman, 1987) has found that computer assisted reading programs facilitate FL reading comprehension. Some advantages of computer-assisted instruction that have been shown are in vocabulary acquisition, reading strategy training and motivation.

Kleinman (1987) conducted a study where he compared computer-assisted reading to traditional reading materials. The results showed that there were no differences in the score gains for reading comprehension between the control and the experimental groups. Kleinman explained that it was due to the fact that

the reading software was based on behaviouristic learning theory. He suggests that the software material should be based on up-to-date learning theories. It also should introduce and give students practice with learning strategies.

In another study, conducted by Aweiss (1995) with 24 American students of Arabic, the treatment was as following: 1) text only, 2) text with glossary, 3) text with glossary and verb conjugation, and 4) text with glossary, verb conjugation and background information. The results showed that reading support helped with comprehension. Aweiss used a recall protocol test and this kind of test, as mentioned before, has been criticised (Wiley et al., 2005) for being more a memory test than a test that shows an understanding of the text.

The question of how to assist comprehension using verbal and visual material has been raised in several studies (e.g. Mayer, 1997; Sharp et al., 1995). Results show that with technology the learning environment can be more interactive and salient and in this way facilitate comprehension. Paivio (1986) claims that it is easier to remember when both types of information – visual and textual – are available, since there are two traces in memory instead of one. Within this theoretical framework (the dual coding theory) Mayer and Moreno (1998) conducted a study where they compared subjects in two different conditions: 1) simultaneous visual animation and audio narration and 2) simultaneous visual animation and visual text. As learning measures they used a recall protocol and a problem-solving task. The group with simultaneous visual and audio information showed improved learning outcomes. Furthermore, empirical studies (Chun & Plass 1996, 1997) have shown how pictures, videos, sound and diagrams aid comprehension by activating schemata relevant to the story (Chun & Plass 1996, 1997).

Computer technology is increasingly present in the classrooms. However, we need to know how this technology can be integrated in the classroom in an effective way if it is to assist FL reading instruction. Kamil et al. (2000) emphasise the importance of determining how, when and by whom learning with multimedia occurs.

Multimedia is common in the classroom and much research work has tried to determine the multimedia applications that are most efficient. Sharp et al. (1995) found that subjects with dynamic visual support recalled a story better than subjects with static images and text only.

Regarding the online environment, Bundsgaard (2008) points out that reading on the Web is a challenge for students and he provides an approach to searching for information and reading it on the Web. His approach stresses the importance of using reading strategies when the students surf the Web with a purpose. In the online language-learning context, Hauck (2005) conducted a study with students of German and Spanish at the UK Open University. The sessions included enhancing learners' metacognitive knowledge and metacognitive strategy use. The findings showed that metacognitive development was fostered by awareness raising activities in online distance language learners.

Kamil et al. (2000) argue that the first studies tried to assess the instruction effects of using a particular medium, whereas recent studies try to analyse how and when learning takes place. Another unexplored field mentioned, and important for literacy and technology, is the role of cognitive strategies in the comprehension of graphics and text and whether they can be explicitly taught.

One aspect of this study is the relationship between research on reading processes and how to apply it in a FL language-learning situation in order to make FL language learning more effective. Another aspect is the impact of mobile technologies in learning, which is discussed in the next section.

2.7.2 Reading on mobiles devices

Mobile learning concepts range from the mobility of the device to the support of informal learning outside the classroom (Sharples et al. 2007). Traxler (2005) discusses various issues with the different definitions, and especially the mobile learning versus e-learning distinction. The definition of mobile learning that he proposed is "any educational provision where the sole or dominant technologies are handheld or palmtop devices" (p.262). However, the term has evolved and it

now emphasises the mobility of the learner rather than the mobile technologies (Kukulska-Hulme, 2013).

Another view of mobile learning is the learning that takes place using mobile devices either inside or outside the classroom (Bradley & Holley, 2010). In a longitudinal study Bradley & Holley investigated students' attitudes to using mobile phones and how they used them for learning. Data gathered from a survey showed that there were two areas of increased use: Internet access and user generated content. This data was compared to data from 2007 where students used their phones more for communication. The study adds evidence to research on mobile technologies which shows that these technologies help in engaging students with learning activities.

Finally, Winters (2006) proposes that "learning is mediated through mobile technologies, which are in themselves interwoven with other learning tools" (Winters, 2006, p.8). The concept of mediation in this definition matches with the S²R Model chosen as theoretical framework for this study. As discussed in section 2.3.1, the S²R Model includes the concept of self-regulation. Self-regulated learning in mobile learning – which is the context of this study – is one of the components for successful learning (Sharples, 2002)

There is little research into the reading of academic digital materials in a mobile format. In a study, Lam, Lam, Lam, and McNaught (2009) used a two-phase research design to investigate the usability and usefulness of e-books on mobile devices. They used 3 different pocket personal computers PPCs (Mio DigiWalker P550, HP i PAQ hx2400 and HP i PAQ hx2700). They defined usability as "the ease of use of the technology" and usefulness as to whether the technology is an effective learning tool. The participants were 12 students from different disciplines who had never tried to read an e-book on a PPC. The study took place in two phases. In the first phase 6 students reported their first impressions of reading e-books. In the second phase the other six students were asked to read for a period of 12 weeks in a real learning situation. In this phase the focus was the actual use of the mobile devices as a learning tool. The reading period of this group was spread over 4 months and they were free to choose their books as long as they

were academic. In both phases students received an introduction to the PPCs and hands on training. There was a comprehension test at the end of the reading period in both phases. At the same time, a control group of four students read a similar set of reading materials but in a paper based format. Results showed that students in phase 1 were more positive about the pre-reading setup (installation of the software that allows the PC to communicate with the PPC, finding and downloading an e-book and synchronising the e-book to the PPC). Students in phase 2 found more problems when they used e-books on their own. Most students found that the PPC functions were easy to learn. Results also showed that students in phase 1 had more problems in using the PPC functions on their own than students in phase 2. Researchers explain these differences by arguing that students in phase 1 used the functions just after having learnt them while in phase 2 they used them in a longer period of time.

Another main concern in the study was the learning potential of technology. For this purpose enjoyment and comfort of the reading process, reading comprehension and students' reading habits were measured. Students in both phases mentioned a number of factors that are important for the reading process, e.g. hardware, software and the materials. Concerning enjoyment and comfort in using e-books, comparisons between the two groups showed that the students that had the e-books for a longer time were more negative about technology. The question of whether students reading digital texts understood more than students reading a paper book was examined by comparing two groups. The paper-based text group had higher scores in reading comprehension and the researchers concluded that reading in a digital format is not efficient. Even though they admitted that the sample size was too small for a statistical comparison (six students reading on a PPC and four students reading a paper book).

Since the comprehension test is not included in the Lam et al. paper, it is not possible to assess whether the questions were based on recent research about the core elements of subject matter reading skills (Arnbak, 2003) and thus that these results measure reading comprehension. Moreover, Kamil et al. (2000), in a complete review of using computer technology in reading, argue that research into the use of technology to enhance reading comprehension has shown that

video segments, interactive learning activities and vocabulary exercises embedded in the digital text enhance reading comprehension and thus speed up the process of learning. Lam et al. (2009) conclude that e-books need to be improved in order to be a tool for academic reading – students' experience with the technology influences their use of e-books. Finally, they strongly recommend user support when introducing technology. This study is still relevant today and for other mobile devices such as iPads, which will be discussed in section 2.7.5.

The feasibility of using e-textbooks in an academic environment is investigated in a study by Rickman et al. (2009). The pilot project took place in The Northwest Missouri State University in two phases. In Phase I (fall 2008), 200 Sony e-book readers were delivered to students. In this phase the focus of the study was to investigate whether e-book readers were an optimal tool for distributing e-textbooks. Focus group sessions held with students and faculty showed that the readers were not completely developed. They lacked search and annotation features, colour images, multimedia programs, and hyperlinks within the e-textbooks, which are important when reading academic texts. For that reason, in Phase II (spring 2009) the focus of the study was to investigate e-textbooks designed for use on laptops. In order to investigate how students' reading and study behaviour was influenced by the use of e-textbooks, participants' in Phase 2 answered a survey. Results showed that 60% of the students felt they read more when using physical textbooks than when they read e-textbooks. 56.25% of the students found that e-textbooks were more convenient for learning. Cost comparisons also played a role; the majority of the students preferred e-textbooks if a change to e-textbooks were to prevent the rental fees from increasing. The authors conclude that the process of transition to e-textbooks was more complex than expected due to factors such as e-textbooks' availability and the University's current inventory of traditional books. They suggest that a successful implementation of e-book technology in education can only take if e-textbooks are integrated with supporting multimedia and other learning resources.

Nie at al. (2011) investigated whether the use of e-book readers helps to engage students with essential readings. Findings showed that students were very positive about the portability and flexibility of the device. However, their learning

behaviour did not change. Students used the e-book readers to get a general idea at the start of the module, but printed the learning material when they had to study the subject in depth. These results may suggest that, as in the Rickman et al. (2009) study, the e-book readers' software is not still fully developed as a learning tool even though they are very convenient for other reading purposes, such as reading a novel. This is in accordance with Marshall's (2010) description of different types of reading and degrees of interaction with the text. For example, when we read a short story it requires very little interaction with the text but when we study a textbook much more interaction is needed. Therefore, as discussed above, if e-book readers are to be successfully implemented in education, the software design has to be based on a solid theory of the reading process.

2.7.3 Mobile assisted language learning

Kukulska-Hulme (2013) defines mobile-assisted language learning (MALL) as "the use of mobile technologies in language learning, especially in situations where device portability offers specific advantages" (p.3701). In her definition, she emphasises the value that mobile technologies could add to learning. Kukulska-Hulme and Shield (2008) argue that mobile assisted language learning (MALL) differs from CALL "in its use of personal, portable devices that enable new ways of learning, emphasising continuity or spontaneity of access and interaction across different contexts of use" (p.273).

Godwin Jones (2008) reviews several mobile devices – iPhones, laptops and e-book readers – and their potential in foreign language learning (FLL). Among other advantages in using mobile computing for FLL, he mentions the capability of using "text messaging for language partners, language class linking through Facebook updates, or Twitter updates as part of a lesson on verbs describing one's daily routine" (p.8). As far as the e-book readers are concerned, he suggests that it would be interesting to language learners if it was possible to listen to and read a text at the same time. Godwin-Jones (2003) writes that text interaction becomes richer when a text is digitised. He claims that with the help of interactive tools "static texts" can become "learning tools" (p.7).

With the appearance of the iPad, the potential for digitised texts to become learning tools is greater. Since mobile devices are gradually entering the language classroom, Lin (2014) urges researchers to find out "whether second/foreign language reading on mobile devices demands different strategies or not, because language instructors need to be informed of efficient strategies to teach their students. Empirical evidences for reading strategies on mobile devices, or simply mobile-assisted reading strategies, are needed" (p.57).

2.7.4 Reading strategies in the digital environment

With text digitisation, numerous new contexts for reading have appeared: the Internet, hyperlinks, e-books, etc. Since using the Internet requires much reading, many studies (Afflerbach & Cho, 2010; N.J. Anderson (2003); Coiro, Castek, & Guzniczak, 2011) have investigated the use of reading strategies in this relatively new environment. As to the question of whether Internet readers use new strategies, Afflerbach and Cho (2010) found in a comparative analysis (32 studies that examine Internet and hypertext reading) that there is a correspondence between the use of strategies in traditional print and in Internet reading. Several strategies are transferred from traditional to Internet contexts and vice versa. They assert that the strategies identified for traditional print texts help to predict the reading requirements of the Internet. They also found a new category of strategies, which they named "realizing and constructing potential texts to read". These strategies assist readers to cope with "unpredictable structure, content, and interactivity that Internet reading can involve" (Afflerbach & Cho, 2010, p.220). A very different result was found by H.R. Schugar et al. (2013) in another reading context: an e-book on an iPad. They found that the participants in their study did not use the reading strategies that they normally employed with print texts.

Some reading strategies change in the digital environment, for example skimming in Internet reading is different than in traditional text reading because "the text or series of texts to be encountered may be partially hidden, unknown to the reader and unanticipated" (Afflerbach & Cho, 2010, p.205). This change also applies to reading e-books, where previewing is challenging (H.R. Schugar et al., 2013). Kol

and Schcolnik (2000) define the terms scanning and skimming to match screen reading. Screen scanning is defined as "quickly searching for specific pieces of information by using the Find feature of the word processor" (Kol & Schcolnik, 2000, p.70). Screen skimming is "reading the hyperlinked outline provided, clicking the outline to access specific sections of the text, quickly reading and highlighting those sections, and scrolling to read the highlighted sections to get the main ideas" (Kol & Schcolnik, 2000, p.70). In an interview by Rosenwald (2014), Maryanne Wolf expresses worries about online skimming and scanning. She maintains that students might be less inclined to reflect when they read digital texts. However, Auer (2014) found evidence of cognitive and metacognitive processing when Spanish adult learners read with iPads.

Finally, reading on the Internet involves a cycle of higher thought processes (Coiro & Dobler, 2007). Coiro and Dobler found that Internet reading prompted a recursive pattern of self-regulated reading. These results are similar to studies in traditional print reading where students employed different strategies in a "dynamic interplay" (Lee & Wolf, 1997, p.38). In the context of reading a foreign language Park et al. (2014), based on Coiro & Dobler's (2007) framework, found that the decision-making process for trying to understand vocabulary in the readings also followed this recursive model. This reading process shares commonalities with task-phases in the S²R Model.

2.7.5 Technological features in mobile devices that support FL reading comprehension

A concept related to learning technologies is the concept of *affordances*. Gibson (1977) defines it as follows: "the affordance of anything is a specific combination of the properties of its substance and its surfaces taken with reference to an animal" (Gibson 1977, pp. 67). Gibson (1977) argues that the user might not realise the affordances. In the field of electronic reading, features such as bookmarking, annotating and highlighting which support important strategies, such as summarising and localising main ideas, are not employed by students even though they annotate and highlight when reading traditional print texts (J.T. Schugar, Schugar & Penny, 2011). One possible explanation could be that the

features of the e-readers chosen for the study were not intuitive. Awareness of a system's features influences how learners use affordances (Hill and Hannafin, 1997). As a novice user, students might adopt strategies for learning the technology (Gabarre, Gabarre, Din, Shah & Karim, 2014). The concept of digital natives, introduced by Prensky (2001), created the illusion that students would not need instruction in new technologies. However, when introducing a technology into the classroom, much time is spent teaching how to use the device instead of focusing on the subject-matter (H.R. Schugar et al., 2013). Therefore, it is important that readers acquire competence in both in reading strategies and the specific reading features of a digital environment (Afflerbach & Cho, 2010).

There is little research into the relationship between e-books and comprehension (H.R. Schugar et al., 2013). It is not clearly established whether e-books' features hinder or assist comprehension. From the reading perspective, features can help to scaffold the online reading process (Coiro et al., 2014). From the learning perspective, the information retrieved by the mobile device's features can function as "a lasting memory aid and a valuable, tangible link between different learning environments" (Kukulska-Hulme, 2013).

One feature that has been researched is electronic glosses[9] and their effects on reading comprehension. The theory behind using electronic glosses is that they support readers in bottom-up processing. They allow free space for working memory, so it allows the reader to use top-down processing. Research has shown that glosses have an effect on vocabulary acquisition and not on reading comprehension (Chun, 2006). Thus vocabulary, as we have seen in the section above, is only one component of reading skill (Chun, 2006). In Huang et al.'s (2009) study, students used dictionaries and highlighting much more than other strategies. Shen (2014) also found that young English as foreign language (EFL) learners relied most on support (SUP) strategies. This was contrary to the features in Chun's study (2006), but in accordance with Levy's (2009) recommendations that the annotations have to be intuitive. Looking up words may interrupt the reading process so it is crucial not to rely solely on this strategy (H.R.

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[9] Glosses are either translations or explanations of challenging words or phrases in a FL text.

Schugar et al., 2013). For example, students can use inferring; in the digital environment the strategy of inferring can be accomplished using other clues such as sound and animations (H.R. Schugar et al, 2013).

To sum up, most research on reading strategies has been conducted using traditional print texts. Consequently, classroom practice is based on studies that were conducted before the advent of mobile devices. There is a need of learning design that is informed by research on mobile reading and research on reading strategies for mobile devices. Moreover, the potential of electronic features for supporting comprehension are not fully exploited.

2.8 Chapter summary: Literature review

This chapter presented the theories and concepts that constitute the conceptual framework of this thesis. It focused on four approaches to reading: Metacognitive Theory, Schema Theory, the Interactive Model and the Construction-Integration Model. The first two highlight the importance of the reader's active internal cognitive engagement while reading. The two latter explain the complexity of the reading processes and the importance of using information from multiple sources – syntactic, semantic, orthographic and lexical information – during the reading process. In the four models of reading presented, reading strategies play a role but they do not explain in detail how the interactions between reader and text take place. The cognitive and metacognitive strategies in the Strategic Self-Regulation (S²R) Model, when applied to reading skill explain in detail how readers use reading strategies. In this way, this language learning model supplements the reading models. Moreover, in the S²R Model, strategies can be mediated by the teacher or by technology. Thus, the concept of mobile language learning was introduced. To sum up, reading models provide an explanation of the reading process, reading strategies a detailed account of these processes and mobile technology is the artefact by which strategies will be mediated.

3 PILOT

This chapter outlines the purpose, design, data collection methods, procedures, data analysis and results of the pilot study. Emergent outcomes of the pilot had an impact on the design of the main study (Chapter 4). A more in depth discussion of the paradigm and design guiding this research, the process of analysing data and ethics will be given in Chapter 4.

The purpose of the pilot was threefold, namely:

- To gain in-depth understanding of digital reading in a foreign language, in particular the potential for mobile devices to assist with comprehension and to develop research questions
- To develop instruments for collecting evidence of digital reading processes and to test these instruments
- To pilot test the mobile technology

The pilot was conducted based on prima facie[10] research questions. Thus, the research questions for the main study were refined based on analysis of the data gathered in the pilot.

The research questions guiding the pilot were:

1. **How do learners of Spanish perceive the role of e-book readers in the process of foreign language comprehension?**
2. **How can e-book readers assist learners of Spanish in their comprehension processes?**
3. **To what extent do learners of Spanish use metacognitive strategies in the process of learning a foreign language using e-book readers?**

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[10] A prima facie research question is one that changes in the course of the research process as it is refined to the final research question; "…it may become transformed as you read, conduct pilot work and develop new ideas" (Thomas, 2011, p.35).

The pilot study had a duration of 4 months, from March to June 2010.

3.1 Design

In the area of e-book readers and foreign language learning, literature on the topic is scarce and there is little experience to draw on with which to generate hypotheses. Therefore, a qualitative approach is more appropriate since it allows the identification of patterns and themes from the data (J. Mason, 2002). A case study methodology was chosen because it is the most appropriate method for empirical inquiry when the aim is to understand how a particular behaviour takes place. Moreover, for this study I wanted to collect detailed information from a restricted sample. The choice of case – a group of students taking Spanish at A-level at an adult school in Denmark – was chosen for two reasons: firstly, my role as both researcher and teacher meant that I was closely connected to my students, and secondly, as a staff member at the school, arranging for permission to do research was easier allowing for detailed observation of their learning. The rationale for selecting an exemplifying case (Bryman, 2008) was that the case provided an adequate context for examining comprehension processes in adult learners using e-book readers.

3.2 Research setting

The setting in which the research is conducted is important in a case study (Thomas, 2011). The school chosen for the study is an adult education centre in Denmark. Its mission is to offer general adult education to the adult citizens of the locality. It offers full-time 2-year programmes and single subject courses at secondary education level leading to the Higher Preparatory Examination, which qualifies for admission to higher education. Additionally, it offers courses in very basic Danish and mathematics, special education for dyslexic people, and Danish as a second language. About 3000 students attend courses every year. They are men and women of all ages (>18 years-old) and with a variety of cultural backgrounds. Most of the teaching takes place between 8 am and 10.30 pm Monday-Friday in classes of 25-30 participants. A small part of the teaching is made up of flexible offerings, wholly or partly as e-learning, individually adjusted

to the participants' work and family life. The school offers language courses in the morning, afternoon or evening. At the time of the pilot (2010) most students attending evening courses had a higher education qualification, while most students that attended in the morning and the afternoon did not. For most of the courses print books and 'Fronter', the school's virtual learning environment (VLE), are used.

An evening Spanish course was selected for the study. The course aimed at passing the Higher Preparatory Examination, but most participants that attended this course did not sit for the exam – their aim was "just" to learn Spanish. The course attracted 30 students a year (at the time of the pilot) and it could be completed in one or two academic years. All students in the targeted class had chosen the two-year option. The course had high dropout rates. The average student attendance was 73% from September until December 2009 and 40% from January until May 2010.

3.3 Participants

A class of Danish continuing education students studying Spanish were asked by their teacher (myself, who acted in both roles – researcher and teacher) if they would be willing to participate in the study. The number of students registered in the course was 31 but not all attended the course. Since attendance was very low the day the students were invited to take part (11 students were present; 4 students agreed to take part in the study) an invitation to participate in the study was sent by e-mail to those who were not present. From this, two more students volunteered, making a total of 6. They were aged between 24-65, both genders, and had no experience in using e-book readers.

Since they were in their first year of learning Spanish, they did not have to sit an exam in June 2010. It is only when they have completed 2 years that they can register for the exam. The school offers the option of doing the course in one year, but none of them chose this option. At the end of the two years (June 2011), only one participant sat the exam

3.4 Material and apparatus

3.4.1 Guidance on the use of e-book readers

The study consisted of an introduction to the technology, guided hands-on training showing how the hardware and the software functioned, presentation of Internet addresses, bookstores and libraries where e-books are available for free – both in text and in audio format – and an explanation of the different types of files supported by BeBook One eReader – the model of e-book reader used for the study (Figure 5). The aim of the guided hands-on session was to give participants the opportunity to get acquainted with the functions of the e-book reader so that they would be able to begin reading the Spanish material.

Figure 4. BeBook One eReader

In the session following introduction of the study, all the students present (whether participating in the study or not) were introduced to the Adobe Digital Editions software and to the Gutenberg project website, which has free out-of-copyright e-books to download. They were then shown how to download e-books and e-material to Adobe Digital Editions and how to import them to an e-book reader. Only 3 out of the 6 participants of the study were present; the other 3 met the teacher/researcher (myself) on a one-to-one basis later. The students present who were not participating in the study appreciated the introduction; in particular, the web site shown gave them access to free reading material in Spanish, which they did not know about.

In the third session all the information which was given orally in the two first sessions was written and delivered as a paper copy to all the students in the class, since the e-material was relevant for all. This information was available for download from the school's VLE as well. Together with the e-book reader, the participants received an instruction manual for the Bebook One eReader, in Danish. A forum called "E-book readers troubleshooting" was created in the VLE so that participants could share their problems with the technology, tips for enhancing its use and useful links about e-books.

3.4.2 Learning materials and e-book readers – delivery

The e-book readers were pre-loaded with 3 collections of Spanish stories in EPUB file format and two audio stories, all of which were downloaded from http://www.gutenberg.org which, as mentioned above, was the only collection of out-of-copyright e-books available at the time of the study. This was supplementary learning material, which is to say, it was not used in the classroom. Participants were told that they could download any material they liked to the readers in addition to the pre-loaded material, and read as they pleased.

After the introductory session in March 2010, students were asked to go to the School Library and borrow the pre-loaded e-book readers which they would have on loan until June 2010, given that the focus of the study was on students' experiences over a period of time and between locations. Due to the school's strict rule of not loaning an e-book reader until the student paid a deposit of 505 DKK (67.9 €, May 18, 2016), not all the e-book readers were delivered at the same time, which meant that some students started using their e-book reader before others.

Table 4 shows the steps followed to prepare the e-book readers and to engage students in using the technology.

Step	Description
Pre-loading	All e-book readers were pre-loaded with 3 collections of Spanish stories in EPUB file format and two audio stories in MP3 format from the website Project Gutenberg http://www.gutenberg.org
Guidance Introduction to the e-book readers Presentation of e-materials	The teacher/researcher introduced the technology: showing how the hardware and the software functioned, presenting some Internet addresses, bookstores and libraries where e-books, both in text and in audio format, are available for free, and giving an explanation of the different types of files supported by the BeBook One eReader.
Introduction to Adobe Digital Editions and the Gutenberg Project	Students were introduced to the software Adobe Digital Editions and how to download e-books and e-material to Adobe Digital Editions and onto the e-book readers.
Paper copy delivery of the above	Instructions in paper form of the guidance mentioned above were given to the students.
Delivery	The pre-loaded e-book readers were given to students after they paid a deposit of 505 DKK (67.9 €, May 18, 2016).

Table 4. Getting students acquainted with the functions of the e-book readers

3.5 Data collection methods

Multiple techniques were used to collect data.

3.5.1 Pre-interview questionnaires

Pre-interview questionnaires is a data collection technique that allows to obtain information and to focus the interview questions on emergent themes (Francis,

2007). The process of developing the pre-interview questionnaires was as follows: from the various definitions of the concepts used in the pilot, reading skills and mobile learning were chosen, and the different dimensions identified. In this way, indicators were developed for each dimension (De Vaus, 1996). As far as the design of the questionnaire is concerned, the online survey software SurveyMonkey[11] was chosen, since it follows the principles of questionnaire layout design as defined in Jenkins and Dillman (1997).

3.5.2 Semi-structured interviews

The semi-structured interview method was chosen because it has the advantage of being a two-way communication and in this way it is possible to obtain not only answers but also reasons behind the answers (J. Mason, 2002). It also allows the researcher to explore the research questions and to approach them in greater depth without predetermining them (Radnor, 2002). In addition, from the pre-interview questionnaires it became clear that, in order to explain the different issues with the technology, the written form was not sufficient to express participants' views. They needed to show the different features of the technology in practice, in order to make themselves understood.

3.5.3 Researcher's log

Maxwell (2013) argues that a valuable technique in research is to keep a diary of the fieldwork, including the researcher's ideas and reflections. Consequently, I took notes of students' comments and questions during the study.

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[11] www.surveymonkey.com

3.6 Procedure

3.6.1 Pre-interview questionnaires

Students were asked to complete two online pre-interview questionnaires. The first focused on the e-book reader's usability, and was administered in the 2nd week of May (see Figure 5). The second focused on the reading and learning process and was sent during the 3rd week of June. The full list of questions used in the pre-interview questionnaires is shown in Appendices 1 and 2.

| 2nd week of April | E-book reader delivery | 2nd week of May | Pre-interview questionnaire 1st round | 3rd week of June | Pre-interview questionnaire 2nd round | end of June | Semi-structured interviews |
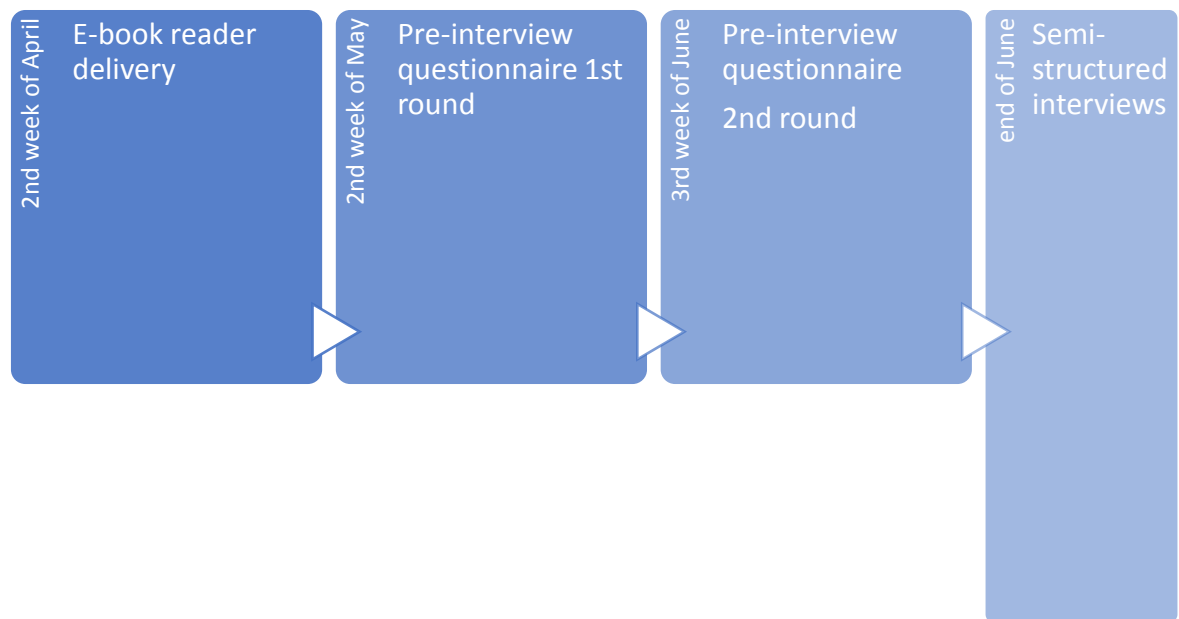
Figure 5. Delivery of e-book readers and administration of pre-interviews questionnaires and interviews

The reason for having two separate questionnaires is that the first questionnaire was administered when the students had had the e-book reader on loan for about 4 weeks, and focuses on the technology. By when the second questionnaire was administered they had been using the e-book readers for a further 5 weeks. It was assumed that by this time they would have automatised the functions of the e-book reader and their focus would be more on the reading process than on technology. Therefore, it was possible to ask them whether they felt their learning behaviour had changed or not.

3.6.2 Face-to-face semi-structured interviews

The students were invited to individual face-to-face interviews at the end of June, either at the school or where they felt was more convenient. The interview schedule designed for the study is shown in Appendix 3. The interviews covered the following areas: participants' learning experience in general, their experiences learning outside the classroom and with foreign language learning, language skills (reading, writing, listening, speaking), learning strategies applied to reading and listening skills, and mobile assisted language learning.

Preparation for the semi-structured interviews was made by analysing the pre-interview questionnaires to maximise the value of pick-up questions on issues which emerged from the interviews. All interview sessions were audio-recorded using an Olympus DS2600 digital voice recorder, with the permission of the interviewees, and later transcribed verbatim.

3.7 Validity, reliability, trustworthiness

Since this study was conducted in a natural setting, that is with real students, a real teacher and a real course, the findings have high ecological validity (Bryman, 2008). In addition, according to Merriam (1995), there is a way to handle validity coherent with the ontological perspective of qualitative research. Among other strategies, she mentions the strategy of collecting data over a period of time in order to understand the phenomenon in its entirety. In this study, data were collected from February to June 2010 through pre-interview questionnaires and semi-structured interviews. Furthermore, being their teacher, I had additional contact every week with the participants.

[In August 2010, as teacher, I implemented some of the participants' suggestions in my teaching and I then had an informal interview with two of the students (one having been a participant in the study)].

3.8 Data analysis

The interviews were transcribed verbatim by another researcher with expertise in linguistics. The digital voice recorder used stores data in the high-compression DSS (Digital Speech Standard) file format, which is effective for sending high-quality voice files attached to e-mails. The DSS files containing the interviews were sent to the transcriber, who used the "DSS player Lite" software to access the recordings. Since the focus of the study was on students' experiences and not on a linguistic analysis, filler words such as 'um' were omitted. The transcriber was requested to delete the data after transcribing.

Qualitative data gathered both from the open questions of the pre-interview questionnaires and from the semi-structured interviews were coded and analysed using the qualitative data analysis software QSR-NVivo 9. Thematic analysis (Boyatzis 1998; Radnor 2002; J. Mason 2002) was used to identify categories and to combine categories into themes. The themes are reported in the findings section.

The process of developing themes for research question 1 and 2 was inductive. Different categories were developed and then included into a particular theme. After that, it was possible to code content into theme categories by reading again the text and highlighting quotes. This process was facilitated by qualitative data analysis software QSR-NVivo 9. The approach used to analyse data is illustrated in Figure *6*.

| Analysis | Reading transcripts | Theme ordering | Reading transcripts | Deciding on categories within the themes | Reading for content and coding with NVivo |
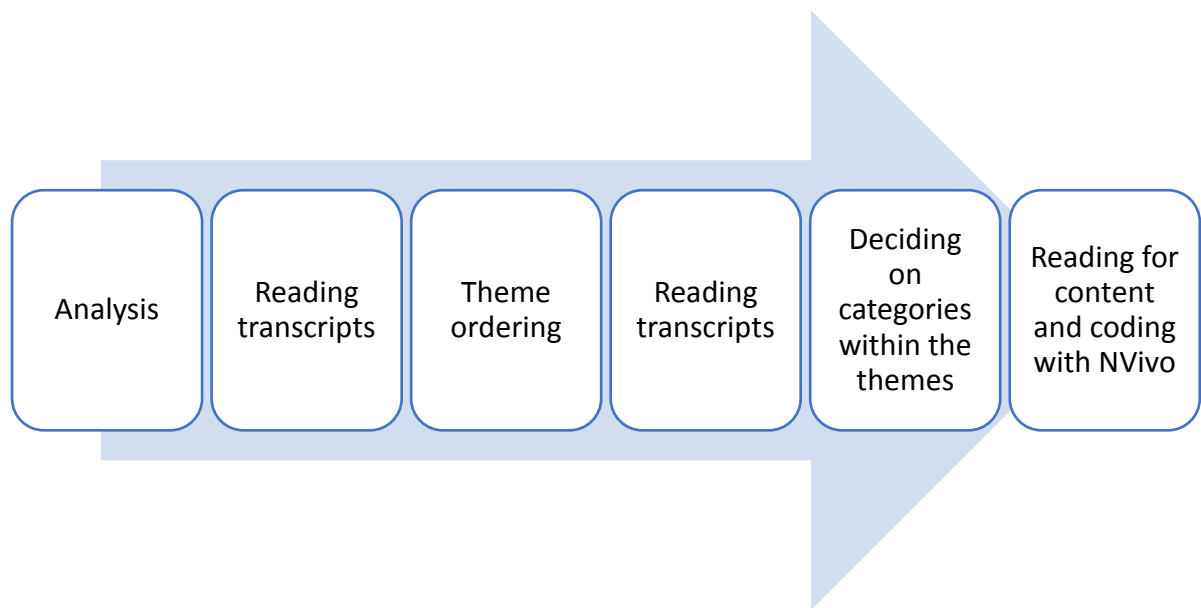
Figure 6. The analysis process

Regarding research question 3, themes were created deductively from theory and prior research. Thus, pre-existing categories were applied to the data using the list of learning strategies created by Oxford (1990). Oxford distinguishes between three sets of metacognitive strategies: centering your learning, arranging and planning your learning, and evaluating your learning. Examples of each set are in Table 5.

Metacognitive strategies	Examples
Centering your learning	Overviewing and linking with already known material Paying attention Delaying speech production to focus on listening
Arranging and planning your learning	Finding out about language learning Organising Setting goals and objectives Identifying the purpose of a language task Planning for a language task Seeking practice opportunities
Evaluating your learning	Self-monitoring Self-evaluating

Table 5. Metacognitive strategies (Oxford, 1990)

For example, under the topic or theme "metacognitive strategy use", there were different categories or subthemes including planning, monitoring and evaluating. These categories were then applied to the data. Figure 7 shows an example of the semi-structured interview data on the theme "metacognitive strategy use".

Planning	Monitoring	Evaluating
• "It will be an advantage to know something about the topic before reading because it will be easier to understand the words in the text." (Student 2)	• "Every time I have met a verb I have checked do I know it?" (Student 4)	• "There were many words I did not understand in the story and I could read it over and over again but you know that you lack words to be sure that you understood what the story was about." (Student 3)

Figure 7. An example of data in the theme "metacognitive strategy use"

3.9 Findings

The findings about how students use mobile devices in foreign language learning are presented in this section by theme.

1. Portability and FLL, i.e. how foreign language learning (FLL) occurs when using mobile technology
   a) Enables reading-while listening mode R/L
   b) Enhances learning: the spacing effect
2. Reading and IT strategies in FLL
   a) Innovative use of the technology to learn vocabulary
3. Metacognitive strategies
   a) Centering your learning
   b) Arranging and planning your leaning
   c) Evaluating your learning
4. Technology
   a) Limitations
   b) Potentials

All of the quotations have been translated from their original Danish version.

3.9.1 Portability and FLL

The findings suggest that reading-while-listening plays an important role in foreign language learning and that mobile devices enable spacing (studying in small sessions), making learning more effective (Karpicke & Roediger III, 2010).

a. Enables Reading while Listening (Aural-written verification - RQ1)

Reading while listening (R/L) is a mode of aural input that is gaining attention from teachers and researchers. Research suggests that listening in the R/L mode increases language proficiency (Day & Bamford, 1998). Another positive effect of listening in this mode is an increase of the students' attention (Chang, 2009). These studies have been conducted with learners of English, but the mentioned benefits could apply to learners of Spanish as well, especially in Denmark where so little Spanish aural input is available from TV, radio, movies, etc.

Interviews with students revealed that it was important for learning Spanish as a foreign language to read while simultaneously listening to an audio file. However, there seemed to be some differences in the justifications as to why or what language skill would enhance the R/L mode (pronunciation, reading comprehension, grammar, etc). For example, one student claimed that it was important to pronounce well the words from the start to avoid fossilisation, that is, to prevent a mistake becoming automatised. (Ellis, 1997). One participant was asked if they thought reading while listening can help improve pronunciation:

> Yes, I think, absolutely. If there is a text together, however. (…)
> Because, you can then say if you are in a class context, so it's
> not certain you want to, what can I say, delay the class, by
> repeating some words several times. And you can do this better
> when you are alone and it's not sure I would do it in the commuter
> train so, well, but then at home alone, and then try to say a few
> words how they feel on the tongue if I had them as sound. But

I've been doing a lot of pronunciation in the beginning. That was my first priority in the beginning because I knew that if I got it wrong, if you get something wrong, one keeps repeating it. (S 4)

Another student found R/L a good tool for implicit learning in pronunciation rather than explicit learning:

Yes, but I think it is quite clear that it ... it does make you listen to the words. For example (…) what's it called, accent rules, when we talked about 'are they rules or are they not rules or is it an exception to the rule? " . I think that it was much easier for me to say the word and put the accent there; for I had heard many of the words I had heard them many times. So I knew where the accent should be rather than how is it now, is it a rule or is it not a rule, and ... but I think it is very individual, how the rules pump into your head. (S 5)

For two students it was also the immediate feedback of what a word sounded like which made the R/L mode attractive:

if you imagine you have one, let's say you have a Spanish book downloaded into it (e-book reader red.) and you for example say: now I'm just not sure, there are some words that are very difficult to say for the Danes because you get such a, for example, in Pedro, is incredibly difficult because you have what it takes soft d and then you have a rolling r right afterwards, no. UHA. If you think about that it might be fun to, well, so one could mark perhaps some words that you just need to hear without having to rewind too much. (S 1)

now I've only used it for the little Spanish I have studied until now, but I think actually the fact that you can combine reading, and so sound it is ideal. Especially, because I found out with Spanish. They say in many languages, you learn to understand before you

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can speak. It is almost the contrary with Spanish, because they speak so fast. (S 2)

The R/L mode can be used as a strategy for text comprehension:

It does not matter how, because it could be that listening would be his shortcut to a text, not words. I believe we learn very differently; there are many who learn through their eyes, and someone by the ears, and someone has to lie down and read, and others need peace, and things like that, no, that is. Well I think I would try and ... try something different than reading. Maybe I will have the text read aloud by the teacher or a classmate or something, or hear it on tape or ... (S 5)

Two students felt their attention increased when listening while reading:

Yes (it helps to listen to the texts red.), especially after I had read the grammar, because then I could recognize, oh, now! this is what it is about and it sounds like this. It is something else than when it is only written.

- Yes, mp3's, for example, when we had that test, I had read the stuff we had to read and then I took the e-book reader an hour and a half when I was out for a walk around the lake. And the fact of being concentrated for a long period of time while listening made me think aha! Now it is that grammar structure that is about and now it is that other grammar structure it's about. I think it's great also to get something into your ears. (S 5)

This "Aha! experience" is paramount in order to acquire a foreign language since "noticing" a language structure is a prerequisite for foreign language learning (Schmidt, 1990).

b. Enhancing learning: the spacing effect

Studying in small sessions (spacing) is more effective than studying for a long period of time (Karpicke & Roediger III, 2010). The findings suggest that mobile devices enable spacing. One student in the interview claimed that they found this way of learning very convenient for learning a foreign language:

> Because, as I said, you do not understand everything right away,
> but if you listen to them (the texts, ed.) at intervals, and then you
> learn something in between, so you catch more and more each
> time and I think it is a good way to learn. (S 5)

3.9.2 Reading and IT strategies in FLL with e-book readers

The findings suggest that when a new technology is introduced students tend to adjust their learning to their needs.

a. Innovative use of the technology to learn vocabulary

In the interviews, four students explained how they were willing to develop vocabulary and IT strategies to help their learning and / or overcome the limitations of technology – in this case, an e-book reader:

> But it could be you just have to find some shortcut or bookmark
> or whatever it is. But it is good that way you could cram
> everything in and have it with you.

Two students that did not use digital materials before participating in this study found another more convenient mobile device for them, namely a mobile phone (iPhone). Having the loan of an e-book reader made them aware of other technologies that could enhance their learning:

> but if you have a cell phone, then it should be affordable if they
> released a new, what's it called a new Spanish book system, for
> example, that you can say well, okay, we do ... those flash cards,

there is a program for flash cards, and so there is a database where there are different flash cards that you can play. Does it make sense? (…) That is a program to play them, to turn them around and so a database which is different. And there is, I have not explored enough, but there is one where you can make your own database too, and at one time or another so I could imagine that I would started it if I, if I had a specific vocabulary I wanted to learn, but I haven't reached that far exploring it. It's clear if you had it a what's it called for a new Spanish system, small apps with the vocabulary in, like the colours, or weather ... words about the weather. (S4)

3.9.3 Metacognitive strategies

In this section, students' use of metacognitive strategies is discussed using Oxford's (1990) theoretical framework. Pre-interview questionnaires and semi-structured interviews revealed that students made use of some metacognitive strategies, such as planning and monitoring of their learning tasks, when they used mobile devices for learning a foreign language. Students did not employ self-evaluation, which is a crucial metacognitive strategy. This result is in accordance with research on metacognitive strategies (O'Malley et al. 1985; Chamot et al. 1987) which shows that students fail to use this important strategy when they learn with traditional print materials.

a. Centering your learning

- Linking with already known material: One student used the strategy of linking with already known material using a laptop.
- Paying attention: One student reported that the process of reading while listening to the text increased attention to the learnt language structures.

b. Arranging and planning your learning

- Arranging learning: Two students used this strategy. The fact of having a new technology for learning made them create appropriate conditions for

learning. For example, a student found flashcard apps fitted her needs for learning vocabulary. Another student found implicit learning more suitable for her needs than explicit learning, i.e. she preferred to listen to the language and notice the correct form rather than learning the rule for the correct form. This strategy was facilitated by the MP3 feature of the e-book reader.

- Planning for a language task: One student used this strategy, taking advantage of the portability of the e-book readers. She read the texts and then she went for a walk and listened to the same texts. Changing to another mode of representation (visual to auditory) made her more aware of the language structures.

- Selecting purpose: Two students used this strategy. For example, one student selected his purpose of reading; he decided to read different books when they complemented each other. This was made easier by the portability of the readers and the features for jumping between locations in reader software.

c. Evaluating your learning

- Self-Monitoring: One student used this strategy for checking comprehension with a mobile device. The rest used it, but with a stationary computer. The handheld device feature that facilitated this strategy was a built-in dictionary. Research has found that students use 70% of their time looking for words in print dictionaries instead of reading. The use of an electronic built-in dictionary is paramount in order to make learning more effective, because it reduces time consulting the dictionary.

- Another strategy used was jumping between locations for checking words (using the glossary at the end of the document).

Table 6 shows strategies used by students related to the technology's features.

Strategies used by learners to support foreign language learning	Related metacognitive strategies	Mobile technology features mentioned
Vocabulary and IT strategies to help with learning

Awareness of reading objectives | Planning: Using conditions related to optimal learning

Planning: Identifying the purpose of a language task | Apps (mobiles and laptops)

E-book readers: portable and lightweight, reading for pleasure
Mobiles and computers: search and bookmark functions, processor speed |
| Awareness about comprehension problems and how to address them | Monitoring | E-book readers: Mp3 tracks
Mobiles: effective cross referencing, built-in dictionary |
| Linking with already known material | Centering learning: directing attention | E-book readers and mobiles: having all learning material on one device
Mobiles: jumping between locations |

Table 6. Students' use of metacognitive strategies

3.9.4 Technology

Since the process of reading through technology was going to play a prominent role in the main study, this theme was very relevant in shaping it.

a. Limitations

Findings from the pre-interview questionnaires and the interviews showed that students were not satisfied with some of the functions in the BeBook One e-

Reader. Some of the functions promised in the user manual that were supposed to work in the e-book reader did not work properly, such as search and bookmark. In addition, reading EPUB files was very slow. In the interviews, participants explained the difficulties and for some, this fact made them abandon the technology.

Interactivity, Interface and Speed Processor

An interesting issue about interactivity and how users define interactivity in a technology was raised by a student who was not satisfied with the e-book reader:

> Well it is quite basic, and also because I worked in the past with IT, if you have to have interactive technology, so it must be interactive, if you press a button and it takes two minutes before anything happens, then it is not interactive. (S 4)

An important issue with this model is the processor speed. Some students that have worked with IT gave reasons why the Bebook One e-book reader was slow at opening files, especially EPUB files:

> No, I think it is simply a question of what is it called? ... It can be two things, one is the processor, how fast it performs the calculations, decent processor speed. And the second is the volume of data: has it enough RAM? That is to say, it is called Random Access Memory, generally speaking, storage. So if it has too little storage space to hold the document so it must constantly take bits of it in and out. So it must have enough storage space to hold the entire document at the same time, from start to the end. And I think it is the prerequisite for turning a page. (S 4)

The student continues, pointing to the fact that on the BeBook website (at the time of the interview) there was no e-books in EPUB format:

> Yes, if you visit their website, notice that there is no EPUB […] formats they have text format.

Another student argued for an upgrade of the model:

> I would also say that the things we've talked about requires an upgrading of the processing power in it (e-book reader ed.) because the model which we have received on loan from the school it's fine, it's ok, but it works very very slow and heavy.

b. Potentials

Students suggested some features that would be helpful for learning a foreign language, such as taking notes, built-in dictionary, text to speech function, etc.:

> if you can imagine that there was a vocabulary for Chapter X of the Spanish book that the words had been put on such small cards there or you yourself did it electronically, well then you can say so I think it has stronger effect that you repeat the words several times during a day or every day, just five minutes every day, it probably would, it probably would have greater effect than that learning three hours in a row. (S 4)

Taking notes

> but I prefer to write. And I think e-book reader cannot quite meet my needs, I need to write down (S 5)

Built-in dictionary

> This requires large memory, but for example there are some places on the Web where you, Wikipedia I think it has such a dictionary function, where you can simply click on the verb and then you can get the verb conjugated, you can see all the verb forms, it could be good if it (the e-book reader ed.) could (S 3)

I need to write down and look up in the dictionary, I did not find
out how to look up words in the e-book reader. It seemed difficult
to me (S 5).

Search function and more effective cross reference

For some students searching for texts within e-books in the e-book reader was
highly important in a learning situation**:**

Yes, but if you only read normal, one page at a time, so it does
not matter, then it is ok, but if you are in a learning situation and
go back and forth, and now I just have to look up a word, and
now I just have to go back three pages back and five pages forth
and then ... it does not work. (S 1)

I think it is really really good if you just have to read, but it is and
it will be for sure really good for learning too but, now I do not
know how this model (Bebook One ed.) compares to others but
it is too slow if you want to look up a word in the dictionary in the
middle of the book, or something like that, it takes too long to find
it

Text to speech function

Yes, I think, I have not spent as much time as I should, perhaps,
but one could imagine, if there was a text to speech function, so
I do not know if there is one in there (BeBook One eReader ed.),
but it is something that is possible.

3.10 Implications for the main study

This study has illustrated students' perceptions of their foreign language learning
using e-book readers. Students found that some of the features could promote
foreign language learning, for example the possibility of reading and listening to
the text at the same time. Portability was also valued; comparing with other

mobile technologies, students felt that reading from the screen outdoors was better with an e-book reader.

The model of e-book reader used for the pilot had some limitations in functionality, such as slow interactivity, which prevented some students using it. Nevertheless, an interesting aspect is that they chose another technology more appropriate to their learning styles, something they had not done before having the e-book readers on loan. That is to say, the fact of being given a technology for learning made them curious about technology enhanced learning in general.

The pilot study fulfilled its three purposes. Moreover, it informed the main study in other areas. Thus the main study was modified with a number of enhancements including: the theoretical framework, the participants, the instruments, the materials, and the mobile technology.

The theoretical framework

Oxford updated her strategy model of L2 learning during the period of the pilot study (Oxford, 1990; 2011). The updated model and further reading of the literature on learning strategies allowed both the research questions and the analytical frame associated with them to evolve and be refined prior to the main study.

The participants

In the pilot, participants had to pay a 505 DKK (67.9 €, May 18, 2016) deposit for the e-book readers. This affected the delivery and the time to exposure to the technology. Therefore, some participants started using the e-book readers before others. In the main study the technology was distributed without such an administration.

Instruments

The focus of the main study was narrowed to FL reading strategies using Oxford's (2011) model of foreign language learning strategies applied to reading skill. Therefore, the interview schedule was developed with more focused questions to

collect the appropriate data in relation to Oxford's (2011) updated theoretical framework.

The pilot study revealed evidence that the interviews should be video recorded in order to get visual data as well as audio. During the interviews, students showed the technology and the different features. For this reason, a video camera was used for the main study.

Reading material

An important limitation for this study was intellectual property rights and copyright restrictions, which limited the choice of e-material in Spanish. Students found that the texts were too challenging. To overcome this limitation in the main study, I developed my own reading material. This ensured that the technology was well integrated with the learning of reading.

Mobile technology

The choice of technology for the pilot was constrained by what it was available in the market in Denmark at the time decisions were made (winter 2009). There were no tablets such as iPads at that time. The e-book reader was not intuitive, and some functions did not work as the manual promised. Thus, learning to use both the technology and the language proved too difficult.

Based on the user needs and expectations discussed above, a tablet was chosen for the main study. The iPad was chosen because it was an intuitive technology (Bennett, 2011) and it was available at the time of the main study. However, the study is not about the iPad specifically, but rather tablet devices in general.

3.11 Chapter summary: The pilot study

The purpose of conducting the pilot was threefold: 1) to gain in-depth understanding of digital reading in a foreign language through mobile technology and to the refine research questions of this thesis, 2) to develop instruments for data collection and test these instruments, and 3) to test the e-book readers and the reading materials. Data were collected at three different points in time using

three different instruments: pre-interview questionnaires, semi-structured interviews, and researcher's log. Findings suggested that some of the features of the e-book readers could promote foreign language learning, for example the possibility of reading and listening to the text at the same time. Participants valued portability. The e-book readers used were rather slow and were thus inconvenient for some students. As a result of the pilot, the main study was modified in the following areas: 1) research questions were refined following the update of the theoretical framework (from Oxford, 1990, to Oxford, 2011) and findings from the pilot; 2) an interview schedule was developed to match the updated theoretical framework; and 3) the mobile device was changed, a tablet was chosen for the main study.

4 METHODOLOGY

Chapter 2 identified five key research areas: reading, metacognition, learning strategies, foreign language (FL) learning, and technology-enhanced learning (see Figure 1). The theories and concepts discussed from these research areas provided a conceptual framework that may be used to understand the potential of tablet computers in supporting students' FL reading strategies.

Chapter 2 also uncovered related research gaps:

- There is a lack of studies around the types of FL reading strategies that students use with tablets.
- There is very little research around which specific functions of the tablets may enhance the use of FL reading strategies.

This study contributes to filling these gaps by identifying reading strategies of FL readers when using tablets, and by determining how tablets can mediate reading strategies and metacognitive processes to assist with students' comprehension. This study focuses on the FL reading behaviour of 12 students from two different schools who read texts on iPads.

This chapter describes the research paradigm guiding this study and discusses the choice of design, setting, materials, data collection and analysis procedures. It also includes validity and ethical considerations.

4.1 Research paradigm

The paradigm is the way we approach an inquiry (L. Cohen, Manion, & Morrison, 2011). T. Kuhn (1970) defines the term paradigm as "the entire constellation of beliefs, values, techniques, and so on shared by the members of a given community" (p.175). Epistemology – how do we acquire knowledge of the phenomena under investigation – and ontology – what is the nature of the

phenomena under investigation (J. Mason, 2002) – are paramount in research, since they will have an impact on the research design and research process (L. Cohen et al., 2011; DePoy & Gitlin, 1998).

Social science has adopted the traditional view from the natural sciences on how to research phenomena (L. Cohen et al. 2011; Thomas 2011). Scientists adhering to positivism define knowledge as a "part of a reality that is separate and independent from individuals and that is verifiable through the scientific method" (DePoy & Gitlin, 1998, p.26). Consequently, knowledge can be discovered by reducing reality to its constituent parts, isolating a variable, measuring it and generalising the findings. This research paradigm is characterised by the relationship between cause and effect and by universal rules.

Social scientists began the discussion of philosophical stance in science (Maxwell, 2013); before social science research there was no such debate because research followed a positivist paradigm. Thomas (2011) argues that social scientists cannot do the same kind of experiments as natural scientists. In the natural sciences, the researcher can measure, isolate and manipulate variables in controlled experiments, but in education and social sciences they cannot. As Thomas puts it:

> People do odd things, in a way potatoes don't. People are, in the jargon, agents in their own destiny (in the way potatoes aren't) and in the habit of making subtle or even drastic changes to the conditions for a trial. (p.8)

Along the same lines, L. Cohen et al. (2011) criticise the application of positivism in human behaviour because of the complexity of human nature and because the insubstantial quality of social phenomena is different from the natural world. Reductionist and holistic researchers have argued for their research tradition for centuries but, according to Thomas, in this research paradigm "war", the real mistake has been not thinking about the purpose of research and the fact that there are "different kinds of inquiry for different purposes" (Thomas, 2011, p.47).

In this paradigm war some researchers do not wish to be labelled as positivists or constructivists; they prefer to go beyond labels (Weber, 2004). Padilla (2013) puts it this way: "I do not like labels, as they tend to imply characteristics that may or may not apply".

I do not see there only being two options to approach research. I think the epistemological and ontological assumptions depend on the research question. As Crotty puts it: "Not too many of us embark on a piece of research with epistemology as our starting point. 'I am a constructionist. Therefore, I will investigate…'" (Crotty, 2003, p.13). He explains that research is often planned around a "real-life issue". The point being made here is that I see epistemological and ontological questions as a continuum and where I stand in this continuum will depend on my research questions.

The overarching research question guiding this study is:

How can mobile technology mediate FL reading strategies?

It has been addressed in this study using these two research questions:

1. To what extent do learners of Spanish employ cognitive and metacognitive reading strategies when reading with tablet computers?

2. Which functions of tablet computers facilitate the use of FL reading strategies?

A positivist approach, defining FL reading strategies as a score, based on a standard questionnaire, and measuring participants scores at specified intervals to determine changes, will not give an understanding of how the students use FL reading strategies and why. With a holistic approach, other factors for using FL reading strategies may be discovered. This study will thus investigate what FL learners tell us about the reading task from using iPads.

The epistemology guiding this study is complexity theory[12], a recent paradigm that breaks away from the positivist tradition (L. Kuhn, 2007). After Einstein, the view of a complex and dynamic universe replaced the simple, static view proposed by Newton in which the law of gravity organised the universe (Doll, 2012). Newton's rationalistic view of a closed, predictable universe, where phenomena can be understood by cause-effect relationships, has been challenged by complexity theory (Morrison, 2008).

This new view of the world influences the way we research it (Morrison, 2008). From the perspective of positivism, the phenomenon under investigation can be understood by reducing it into its constituent parts. From the perspective of complexity theory the phenomena under investigation does not break things down in order to understand them in their units, but tries instead to understand the interrelated systems (Cohen et al., 2011). As with other holistic approaches to scientific inquiry, complexity theory investigates the phenomenon in its entirety (L. Kuhn 2007, Thomas, 2011). Complexity theory takes an ontological position which assumes that the view of the world consists of complex systems (Byrne & Callaghan, 2014). It views entities themselves as "thoroughly relationally organized" (L. Kuhn, 2007, p. 159). From a complexity perspective, epistemology and ontology cannot be separated (L. Kuhn, 2007). The focus is on the relations between and among the objects (Doll, 2012). Kellert (1993) explains that the kind of understanding that chaos theory[13] provides us is "not to foresee the system's response to an alteration but to give an account of the way it changes" (p.85).

L. Kuhn (2007) describes and compares Complexity Theory to the Positivist and Naturalistic approaches, drawing on Lincoln and Guba (1985) and Guba and Lincoln (1982) 's five axioms that guide inquiry: 1) ontology, 2) epistemology, 3) the possibility of generalisation, 4) the possibility of causal linkages, and 5) the

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[12]Byrne and Callaghan (2014) define "theory" in the term "Complexity Theory" in the following way: ""For us complexity theory is an ontologically founded framework of understanding and not a theory of causation (…)" (p.8)

[13] The reason why I use Kellert's (1993) work is because Complexity Theory and Chaos Theory are related fields (Doll, 2012).

role of values. Table 7 summarises the differences between positivism, interpretivism and complexity theory.

	Positivism Research	Naturalistic Research	Complexity Theory
Ontology	There is a single observable reality that can be reduced to independent variables.	Reality is constructed in different ways. The most suitable approach to study the multiple constructed realities is holistically.	Reality is characterised by being: dynamic, self-organising, and emergent. It is singular and multiple at the same time. It may be studied from multiple perspectives. However, the act of studying it affects the "reality" observed.
Epistemology	The knower is detached from the known.	The knower and the known cannot be detached They interact with each other.	The knower and the known are dynamic, self-organising and emerging. Their relationship is also dynamic, self-organising, and emerging.
The Possibility of Generalisation	Causes are real and they precede or are simultaneous with their effects.	Only working hypotheses that are related with time and context are possible.	Unless discussing very general organising principles, only working hypotheses that are related by time and context are possible. .

The Possibility of Causal Linkages	Causes are real and they are precede to or are simultaneous with their effects.	Individuals shape one another. It is not possible to distinguish causes from effects.	Individuals shape one another. It is not possible to distinguish causes from effects. Organising patterns may be identified
The Role of Values	Inquiry is value free.	Inquiry is not value free. The researcher expresses his or her values through the research process. The values within the context also influence the inquiry.	Values are implicated in the research process. Often the focus will be on values that will guide the process toward a satisfying outcome.

Table 7. Differing paradigms in social science. Source: Summarised from L. Kuhn (2007)

Since cultural settings and social systems – both individuals as well as groups of individuals – are complex and dynamic, complexity theory accommodates social inquiry. Complexity theory is very appropriate for our time because with today's technological innovations we experience a wide and complex variety of phenomena (L. Kuhn, 2007).

Complexity theory emphasises research settings that are open (not a laboratory) and not under controlled conditions (Cohen et al., 2011). Since this research seeks to be applicable in educational practice, I investigate the students' reading

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behaviour with tablets where it occurs naturally and without trying to manipulate variables.

From the Complexity Theory point of view, a characteristic of scientific theories is change (Doll, 2012). Complex systems are described as "adaptive" which means that "they change as a result of experience" and implies "an exchange of information with the environment" (Byrne & Callaghan, 2014, p.26). The phenomenon under investigation in this thesis, learner strategies, has a changeable character. "Strategies are amenable to change. They are a part of our cognitive software" (Wenden 1998, p.18). In this way, this study is consistent with the ontology and epistemology of complexity theory. The principles of complexity theory capture the essence of learning strategy behaviour and can explain experimental data. Complexity Theory also fits with the Strategic Self-Regulation (S²R) Model of language learning that contributes to the conceptual framework of this thesis. Oxford (2011) argues for the changing character of the strategies and metastrategies in the model as "they respond to changing needs of the learner for varying purposes in different sociocultural contexts "(Oxford 2011, p.19).

In this thesis, learning strategies are applied to the reading skill. The reading process has been reported as being non-linear (Clarke & Silberstein, 1977). Non-linearity is a characteristic of complex systems by which the interactions between elements change over time. Along the same lines, Larsen-Freeman & Cameron, (2008) argue that the reading skill is a dynamic process:

> (…) from a complexity perspective, the process of reading of a written text can be seen as a complex dynamic system moving across a state space landscape that consists of all possible interpretations of the stretch of text being processed. Understanding the whole text is also seen as a complex dynamic system that produces the multidimensional state space landscape on which the reading process moves. The experience of reading the text changes the landscape as the reading process co-adapts with current understandings of the whole text.

Meaning is constructed from the text at different levels using the
reader's previous experiences of literacy, of texts, and of the
world; (…) Attractors in the landscape represent stable
interpretations and each will have a degree of variability. (p.187)

Larsen-Freeman and Cameron's (2008) view of the reading process fits with the
theories of reading presented in Chapter 2, where both the readers' prior
knowledge and the reader's active reflection play an important role in reading
comprehension.

Moreover, metacognitive processes are not linear; they may occur at the same
time when accomplishing a reading task (N.J Anderson, 2008). In the same way,
a learner may employ a number of different tactics for a given strategy. The
process is different from learner to learner; it may appear as chaotic, but
nonetheless a pattern can be found. Figure 8 shows how the chaotic process can
lead to a specific reading objective.

Tactics:
setting goals
determining the study schedule
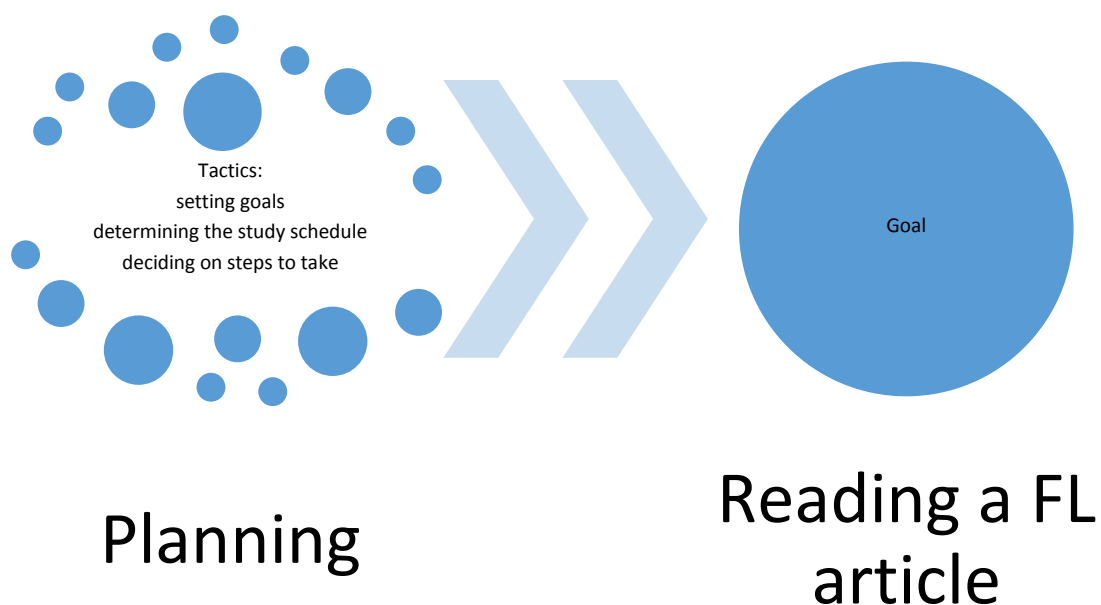deciding on steps to take

Goal

Planning

Reading a FL
article

Figure 8. Metacognitive process in reading

In summary, the reasons why I use complexity theory are as follows:

- Experiments are reductionist and cannot take the whole picture.
- The phenomenon under investigation is studied in a real-life context.
- Language learning occurs through the interactions of learners with their environments. These can be social, physical, material, intellectual, emotional, and cannot be controlled in an experiment.
- Complexity theory is compatible with the theories and concepts that constitute the conceptual framework of this thesis.
- Complexity theory is compatible with the neo-Vygotskyan ideas of the S²R Model which is the basis for my study.

4.1.1. Implications for research methodology

Crotty (1998; 2013) stresses the importance of making the research process and its ontological and epistemological assumptions explicit:

> Why should anyone set store by what we are asserting as a result of our investigation? And what store should anyone set by it? The only satisfactory answer to these questions is, 'Look at the way we have gone about it'. The process itself is our only justification. For that reason, expounding our research process, including its more theoretical moorings (or, if you prefer, the assumptions we bring to our methodology and methods), assumes obvious and crucial importance. (Crotty, 1998/2013, p.41)

Making the research process and the ontological and epistemological assumptions transparent provides credibility to our study. In this way, the reader can judge if the knowledge produced by the researcher is valid. Moreover, it provides coherence to the research project and in this way, it is possible to discern the pitfalls of the study (Maxwell, 2013).

Complexity theory is reflected in the research process in this thesis in the following decisions. First, the choice of case study fits in with the philosophical assumptions of complexity theory since it looks at multiple perspectives of a phenomenon (Cohen et al., 2011). Secondly, Thelen & Smith (1995/1994) recommend conducting longitudinal studies with a few participants. Finally, when conducting research with a complex systems approach it is crucial to try to find relationships within and across different levels and timescales. Therefore, I collected the data at different points in time, so I could observe the development of strategy use over time. Moreover, the use of case study enables connections across levels and timescales. Table 8 summarises the research process of this thesis and the consistency with the research paradigm guiding it.

Stages of the research process	The way complexity theory is reflected in the different stages
Research questions	The type of research questions posed can provide an account of the *way* a system change.
Research design	The choice of case study due to a holistic emphasis.
Participants selection	The choice of a longitudinal study with few participants.
Data collection methods	The use of multiple methods for acquiring several perspectives on a situation.
Analysis	The way analysis was approached allowed incorporation of multiple perspectives.

Table 8. Complexity theory and consistency with the research process

4.2 Design

The aim of complexity theory is to try to avoid breaking up a complex web of activity. In this sense, it fits with the holistic emphasis of a case study. Case study

is the most appropriate method for empirical inquiry when the aim is to understand *how* a particular behaviour takes place. (Thomas, 2011).

There are numerous definitions of case study. In this study, I follow Thomas' definition (2011):

> Case studies are analyses of persons, events, decisions, periods, projects, policies, institutions or other systems which are studied holistically by one or more methods. The case that is the subject of the inquiry will be an instance of a class of phenomena that provides an analytical frame – an object – within which the study is conducted and which the case illuminates and explicates. (p. 23)

I agree with Thomas (2011) in so far as a case is not just an instance of something; in order to be a case an analytical frame (see Figure 9) is needed. In the present study, the analytical frame that focuses the inquiry is the FL strategic reading behaviour with tablet technology. Thomas' definition also includes Stake's definition (2005) where the case is not considered a method. The focus is on the case and it can be studied with a variety of methods.

Case study was chosen because the contextual conditions are relevant to the phenomenon under study (Yin, 2014). This study sought to identify not only the strategies employed by FL learners but also to determine which features in the mobile device helped them to understand the texts. In this study, the focus is on analysing the reading process rather than analysing the individuals. Case study was chosen because the case was the FL reading behaviour of students, but the case could not be considered without the context – mobile learning. Learning across contexts is one of the areas where mobile learning enriches the learner experience (Traxler, 2011). It was with these mobile devices that the reading skills of students were developed and utilised.

In case study, it is crucial to bind the case, just as in quantitative research the development of inclusion and exclusion criteria for sample selection is important

(Baxter & Jack, 2008). Boundaries in case study can be established by definition and context (Miles & Huberman, 1994). This study includes a concise definition of metacognitive and cognitive reading strategies (see chapter 2). The context is provided by the mobile device, a tablet, where the reading process is examined over a period of 4 weeks.

When the interest is not in a single case but on a number of cases in order to investigate the phenomenon, it is referred to as "multiple case" (Stake, 2005). Because the focus is on the analytical frame rather than on the individual case (see Figure 9), I choose a multiple case study. This also has the advantage that the researcher can analyse the data within each setting and across settings (Baxter & Jack, 2008). Thus, I would be able to analyse the different FL reading processes engaged in by students with mobile devices in two different schools. In this multiple case study, I look at 12 adult students of two different secondary education institutions in Denmark who have a level of Spanish corresponding to the B1 level of the Common European Framework of Reference for Languages (CEFR).
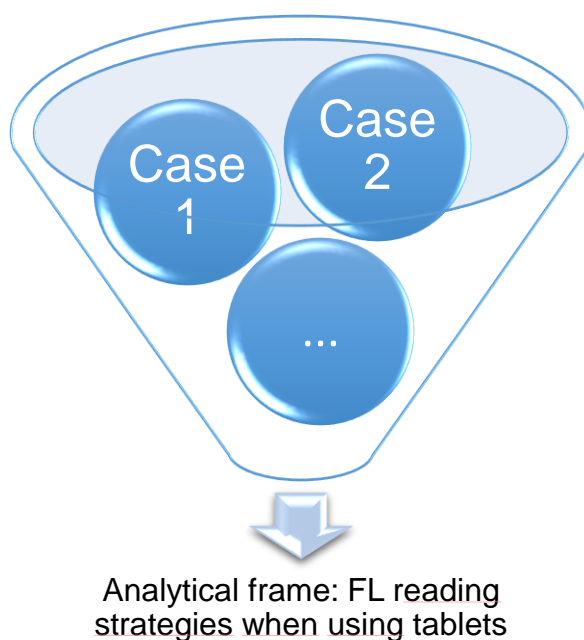

Figure 9. The focus of the multiple case: the analytical frame

Case study can capture changes over time (Yin, 2014). In this thesis, I attempted to find relationships within and across different timescales, as this is crucial within the complexity theory perspective. (Larsen-Freeman & Cameron, 2008). Therefore, I looked at the development of strategy use that occurred over time – three weeks. The micro-development approach allows the study of changes in behaviour over a relatively short time scale (Larsen-Freeman & Cameron, 2008). It provides dense data and allows the researcher to know *how* this development occurs (Thelen & Corbetta, 2002).

4.3 Research setting

The way participants are selected is crucial for achieving external validity, or generalisability, in research (Bryman, 2008). Reaves (1992) explains that the idea of generalisation comes from measurement in quantitative research. In order to generalise findings from a sample to a population, the sample has to be representative of that population. Before measuring the effect of a variable, you need to decide which samples you are going to measure (Reaves, 1992).

In qualitative research, the aim is not to measure an effect or measure quantities, but to understand a particular phenomenon from the perspective of the participant (Mason, 2002). Sampling is not relevant to case study, since the intention is not to find a sample which will represent the population. In case study, the purpose is to focus on the selection without expecting a generalisation (Thomas, 2011). However, the way in which the selection is made is crucial (Thomas, 2011). The choice was determined by my own special knowledge as a foreign language learner teacher in secondary education. The type of case study is thus, a local knowledge case.

The multiple case study conducted in this research included several individuals from two different schools: School 1 and School 2. I chose FL students from two secondary institutions as this might reveal a broader range of differences in reading behaviours. The choice of school 1 (see 3.2 Research Setting) was based both on interest – as a teacher I am closely connected to my students – and on convenience – as staff at the school, access to do research is easier.

The second school, School 2, is an upper secondary school in Copenhagen, Denmark. Its curriculum focuses on media, communications and culture. The school attaches great importance to the use of information and communication technology (ICT) as learning tools and it provides laptops and/or iPads to the students for use both in the classroom, and outside. Learning materials are digital in the first-year. Several classes were using iPads at the time of this study (Spring 2013). An A-Level equivalent in Spanish is offered as a FL course. Students sit the exam at the end of the third-year (equivalent to Year 13 in the UK).

4.3.1 Participants and recruitment

The numbers of participants in my research is consistent with complexity theory and follows Thelen & Smith (1994/1995) recommendations on conducting studies with a few participants. While I would not learn how all FL students extract meaning from the text, I would learn *in detail* how a few FL students do it. Moreover, in order to answer the research questions I used intensive, qualitative research techniques. Therefore, I could only interview a very small number of students from each school I selected. Thus, a purposeful selection of 12 informants was small enough to examine individual cases in detail, but at the same time it was large enough to observe patterns across the group of participants as a whole.

Another consideration for selecting participants was informed by previous work in reading comprehension. The linguistic threshold hypothesis (Clarke, 1980; Laufer and Sim, 1985) states that second language readers must reach a particular level of linguistic competence in the second language to be able to engage in reading comprehension processes. That is to say they cannot engage in complex cognitive processes such as locating main ideas, organizing information, inferring meaning of unfamiliar words, or drawing inferences. Therefore, intermediate Spanish students were selected for the study. The age range in an adult education centre in Denmark is very wide, from 18 year old to upwards. Age was not relevant for the research questions.

In School 1, in order to let potential applicants know about my study, I sent them an invitation by email. Following the ethical guidelines (see

4.3.2 Ethics), the invitation made clear what the study involved. Seven students studying Spanish volunteered to participate in the study. They had already completed one year of learning Spanish (200 hours) corresponding to the B1 Common European Framework of Reference for Languages (CEFR) level. None of them had had any experience of using an iPad to read digital texts in Spanish.

In School 2, I gained access by email and phone contact with the principal. After I had explained the purpose of my study, the principal informed all the Spanish teachers about the project. One teacher was selected by the principal and contacted me by email. We scheduled a day for me to meet her students. I went to the school and introduced myself to them during an A-level Spanish class. I informed them about the study's purpose and asked them if they would like to participate. Seven students were willing to do so, two from the third-year class and five from the second-year class[14]. They had already completed one and two years of learning Spanish. Two students dropped out of the study. I met the students from the second-year class as a group, and the two students from the third-year class on a one to one basis. None of them had had any experience of using an iPad to read digital texts in Spanish.

4.3.2 Ethics

This study follows the ethical guidelines of the University of Leicester. When research involves human participants, ethical considerations must be taken into account (Locke, Silverman & Spirduso, 1998).

Firstly, participants should be properly informed about the purpose of the study. Informed consent requires that participants know what will be required of them and what it means to be engaged in the research project. Accordingly, the purposes and procedures of the study were explained to the participants in oral

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[14] The equivalent in the UK is year 12 and year 13.

and written form, with students being given a Participant Information leaflet and Informed Consent form to read and sign (see Appendix 4).

In order not to affect the students' following of the curriculum, material used for this research was supplementary material. In school 1, interviews took place outside the scheduled lessons in a place of the students' choice – convenient to them – so as not to take much of their time, and so they would feel more secure. All participants who were videotaped during the interview gave their consent to be taped. In school 2, students completed the interviews during the normal class period instead of attending class.

In school 1, the researcher had two roles, teacher and researcher; therefore, it was important to ensure that participation was voluntary. A teacher is in a position of power and influence over their students, so it was crucial that they understood that they could withdraw from the study whenever they wished.

There is much debate about the role of the teacher/researcher. On the one hand, practitioner research has a less approving reputation than university-based research (Zeni, 2001). On the other hand, university-based research is criticised for investigating isolated phenomena and in this way not being able to apply its results to practice (Hedges, 2001). Hammack (1997) suggests that the dual role of teacher/researcher has the potential to undermine the impartiality of the teacher/researcher because of the possibility of a clash between the teacher's agenda and the researcher's agenda.

Within a qualitative design, it is an advantage to have an existing relationship with the participants. The participants have trust in the teacher/researcher and are open to explaining their experiences. Therefore, the teacher/researcher role in this case is an advantage since it allows for the collection of copious data.

L.Cohen (2011) points out the importance of reflection in the teacher/researcher role. By reflection, he means that the researcher should recognise her influence in the research. In order not to take advantage of this relationship, I reflected on my experience of being practitioner and researcher and how my views and

actions were influencing the research process in School 1. Concerning the issue of participants' willingness to please the teacher, my experience was that, as adults, they were aware of what it meant to be involved in research. For example, one participant expressed in the interview for the pilot study that "this is the right way to implement an innovation in teaching". The participant considered it important to give his real opinion in the interview (and not just please the teacher) because it could result in a change in teaching in the next academic year.

Ethical considerations to ensure confidentiality and anonymity have been taken into account when reporting the research. The participants were assigned a number and all documents are referred to by number, for example (I, P2), where I is the data source (interview) and 2 is the number assigned to the participant.

4.4 Materials

In this thesis, I employed hardware, software and digital texts. These will be described in this section.

4.4.1 Hardware

The tablet chosen for the study was the iPad 2. The decision to employ an iPad was made on the grounds that I had to create digital texts for this study, and the most effective software at the time of the study for creating digital texts was iBooks Author. The operating system for iPad, iOS, allows applications to implement certain features, such as tap, hold, drag, etc. In the next section, I will describe iBooks Author application and its features.

A dedicated e-reader application, iBooks, is available from App Store for free. iBooks has a built-in search feature, which allows users to find a word or phrase within the text. It also has a highlight function. These features support important reading strategies: highlighting the text is a strategy that helps the students focus as they read and helps them identify the main ideas in the text.

4.4.2 iBooks Author application

iBooks Author (see Figure 10) is a free Apple application, which can be downloaded from the App Store. It is a very intuitive app for creating e-books – either textbooks or any other kind of text. Just by dragging and dropping texts, graphics or movies can be added to the Book pane (see Figure 10). Moreover, interaction can be enhanced by adding photo galleries, animations and 3D objects. As iBooks use their own file format, these e-books can only be viewed on the iPad. It is possible to create a PDF version of an iBook, which would allow it to be read on all devices that support Adobe Systems' Adobe Reader software. However, as a PDF file it would not support the interactivity that iBooks and iBooks Author offer.
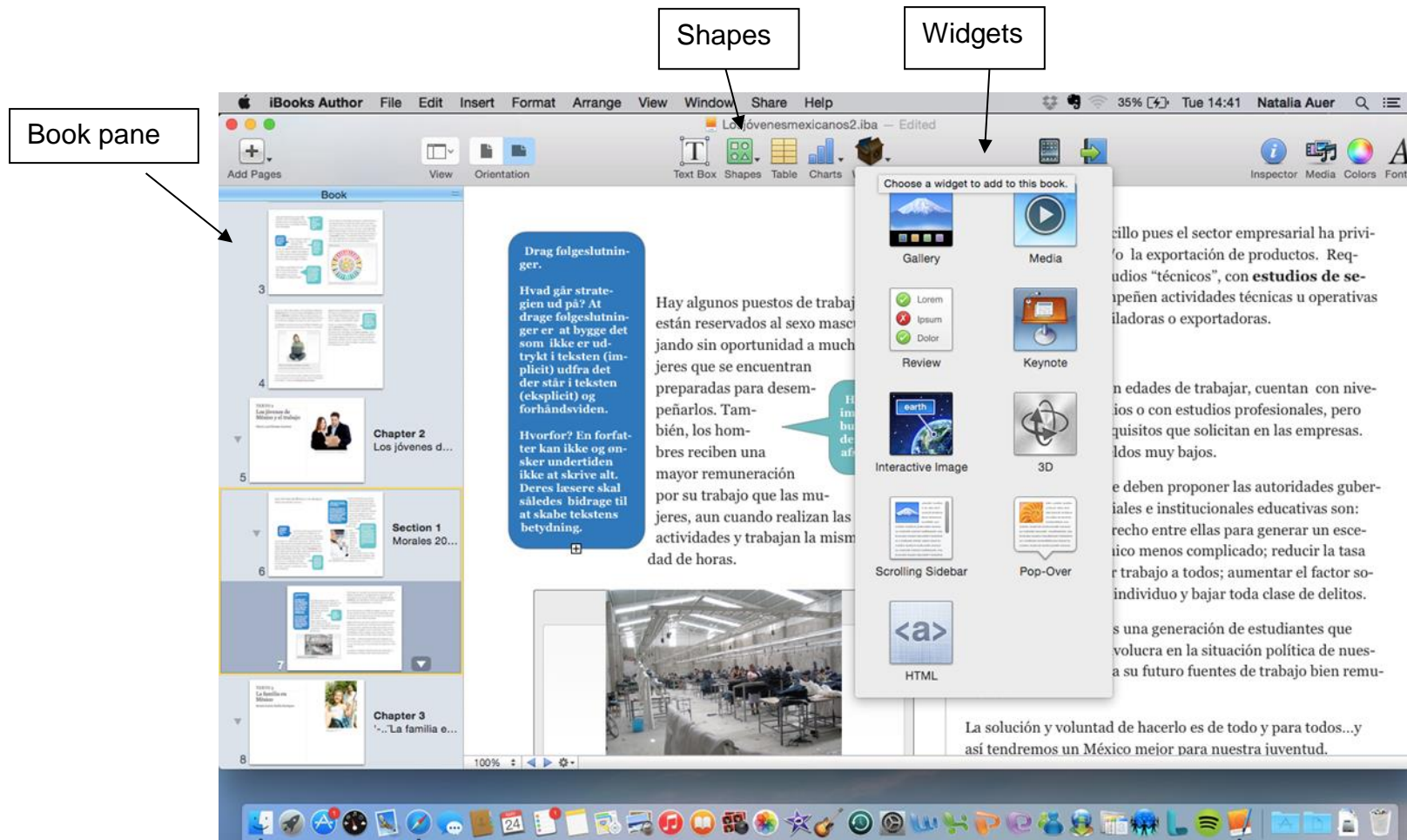
Figure 10. iBooks Author application

In order to make students' reading more effective, features of the application can be used to model metacognitive thinking (Auer, 2014, 2015). In this study, the feature "Shapes" (see Figure 10) was employed for promoting reading strategies. In the following section, I will present the theoretical background for creating digital texts with embedded reading strategies.

4.4.3. Digital texts

The design of the digital texts developed for this study incorporated theoretical principles of the reading process, more specifically, metacognitive processes. It is crucial that the design of reading software is based on reading research (Kim, 2002). The metacognitive approach can be used as a theoretical framework to design reading activities and support comprehension processes with technology (Auer, 2012). I used this approach to design the three digital texts for the study.

What metacognitive theory adds to research on reading is that it explains how proficient readers mentally engage with the text during reading. It is well-supported by research (Afflerbach & Cho, 2010; Coiro & Dobler, 2007) that in order to be a good reader, no matter what the medium, the reader has to be an active reader and engage with the text. Approaches that prompt metacognitive thinking in reading have been proven to enhance reading comprehension (Sheorey and Mokhtari, 2001). These approaches have relied on a teacher's help to model metacognitive strategies, such as activating background knowledge, monitoring and evaluating.

There are different ways of delivering strategy instruction (Cohen, 2011). A usual approach is to provide cognitive and metacognitive training implicitly within the language tasks in the textbooks. However, if the teacher does not explain or model the strategies, students may not learn them, since they are not aware that they are using them (Cohen, 2011). Another approach is to include explicit strategy instruction. The advantage of this approach is that students learn the

strategies and the foreign language at the same time since the activities are contextualised (Cohen, 2011).

The reading process can be scaffolded in order to help students (Urquhart & Weir, 1998). Different types of scaffolds are crucial for promoting different kinds of strategic reading skills (Meyer & Rose, 1998). When scaffolding is used in reading instruction, it promotes a student's ability to understand texts independently (Gibbons, 2015). Gibbons (2015) suggests how teachers can scaffold reading processes in the classroom. One source of scaffolding is where the expert gives assistance by providing guidance and modelling (Walqui, 2006).

Research on reading with computer technology has shown that technology can support specific components of reading (Chun, 2006). Regarding reading comprehension, computer technology can support it by scaffolding student learning Walqui (2006). Meyer and Rose (1998) show how computers can model metacognitive strategies by embedding prompts. However, the instructional design is important – technology per se does not influence learning (Mayer, 2009). Teaching strategies should not be just transferred into the new media, they have to be adapted so the advantages of the digital environment are fully exploited (Grunwald and Corsbie-Massay, 2006).

I shall be claiming that mobile technology can assist students by modelling such strategies just as a teacher would do in the classroom (Auer, 2014, 2015). Mobile technology can replace the teacher as a mediator in this context. However, the electronic features per se do not support reading comprehension (H.R. Schugar et al., 2013). The mediator in this study – the mobile technology – scaffolds students' interactions with the texts so that they develop habits for reading using mobile devices.

Since digital books offer new possibilities, they can be used as metacognitive tools. In the digital environment, students can benefit from digital scaffolds (Coiro, Kiili, Hämäläinen, Cedillo, Naylor, O'Connell, & Quinn, 2014). Metacognitive thought can be modelled using the different features of the iBooks Author

application (Auer, 2014), such as by embedding metacognitive strategies for successful reading in the digitised text (Auer, 2012).

At the time of the fieldwork in 2012, there were no Spanish textbooks with embedded scaffolds that supported FL reading available for iPads. Therefore, I developed my own material with the application iBooks author. I used four criteria for designing the digital texts:

1. All texts should be on related topics
2. The text must be free from copyright issues
3. The text must be challenging, but not so much as to prevent students from using reading strategies
4. The text must include the promotion of reading strategies

In order to meet the first two criteria, a Mexican e-learning researcher and two of her students wrote three Spanish texts. The themes focus on different aspects in the life of young Mexicans. Each text is about 500 words.

To meet the third criterion, I validated the materials in terms of language difficulty as a teacher. The texts used in the present research were calculated to be at B1 level for reading, according to the Common European Framework of Reference for Languages (CEFR). Some vocabulary items were glossed in Danish with the feature "glossary" in iBooks Author app. The choice of which items to gloss was determined by the teacher and researcher by considering item difficulty. Each glossed item was boldfaced in the digital text. Students could tap a term and view its definition in an overlay, so they had the definition instantaneously.

To meet the fourth criterion, the three texts were imported to the iBooks Author application. The three texts formed an e-book named "Los jóvenes mexicanos" (Mexican Youth). The feature "Shapes" was used to model reading strategies. I developed different types of scaffolds to promote and support student's digital reading. The scaffolds provided opportunities to practise activities that promote reading strategies. The reading activities embedded in the digital text were based on those that reading research, mentioned above, indicates as being effective.

Figure 11 shows how scaffolds to support digital reading are embedded. Following the recommendations of strategy instruction, my study did not "pass on a list of strategies to be imitated" (McDonough, 1995, p.87). Instead, the strategies were embedded in a particular context and they had to be utilised in that particular context (see Figure 11). In order to practise the reading strategy in context, a scaffold was provided (in Spanish) that guided the reader in how to apply the strategy in that particular context (displayed in green). The scaffolds were designed to help students by asking them questions and/or making them think while reading and in this way provided opportunities to practice reading strategies such as activating background knowledge, inferring from the context, predicting, etc. There was also an explicit explanation (in Danish) of why that particular strategy should be used (displayed in blue). It is crucial to provide an explicit explanation of why that particular strategy should be used (Oxford, 1990). In addition, explaining why a particular activity is important increases motivation (Hauge, 1999). Since the students' level was intermediate low, the explanations were written in Danish and not in the language they were learning (Spanish). In this project, I did not gradually remove the scaffolds (see 7.6. Limitations).
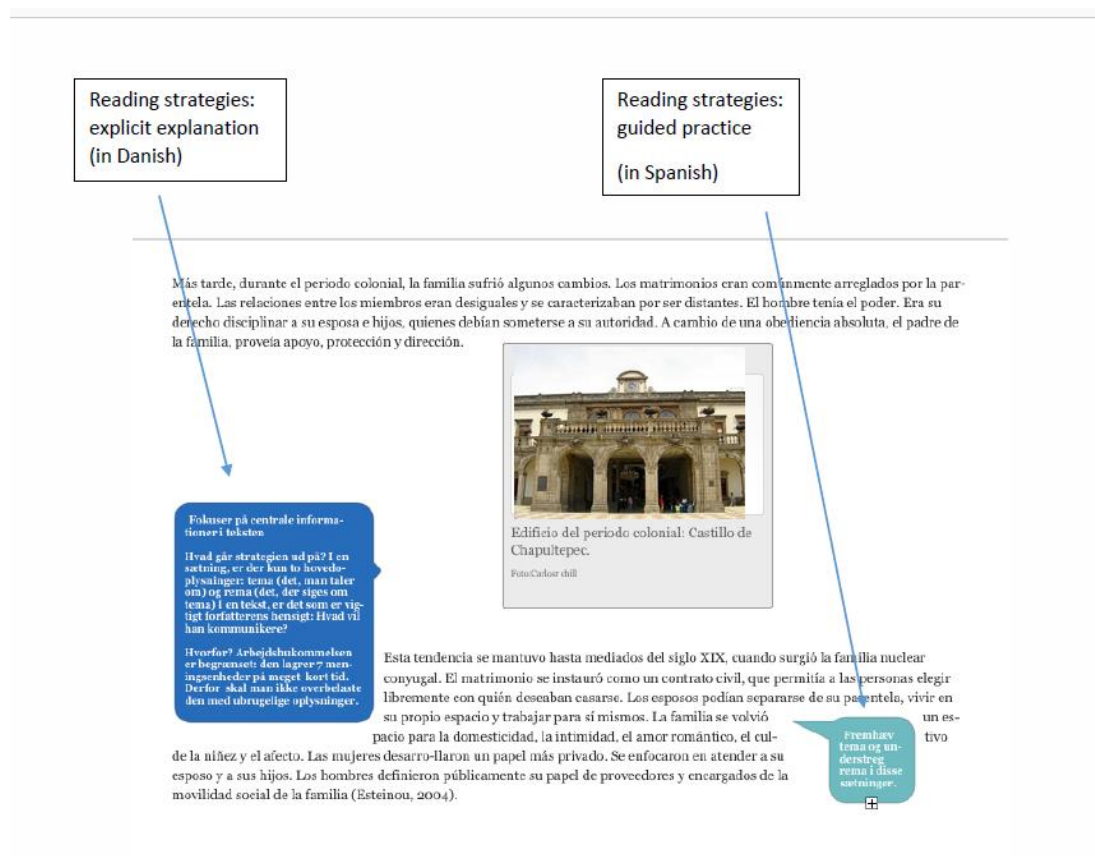
Figure 11 : An example of the iBook with the embedded reading strategies

The study participants were able to access the e-book with the three Spanish texts via Dropbox. The researcher uploaded the ".ibooks" file to a Dropbox Public folder, and then she copied the URL and sent it by email for the students to download and open in the iBooks app on their iPads. Figure 12 shows the steps followed for making the e-book with the three digital texts available on the students' iPads.

The Mexican e-learning researcher and two of her students write the three Spanish texts	→	The researcher chooses appropiate reading strategies for each passage in the texts	→	The researcher uses iBooks Author for creating a digital book with the three texts

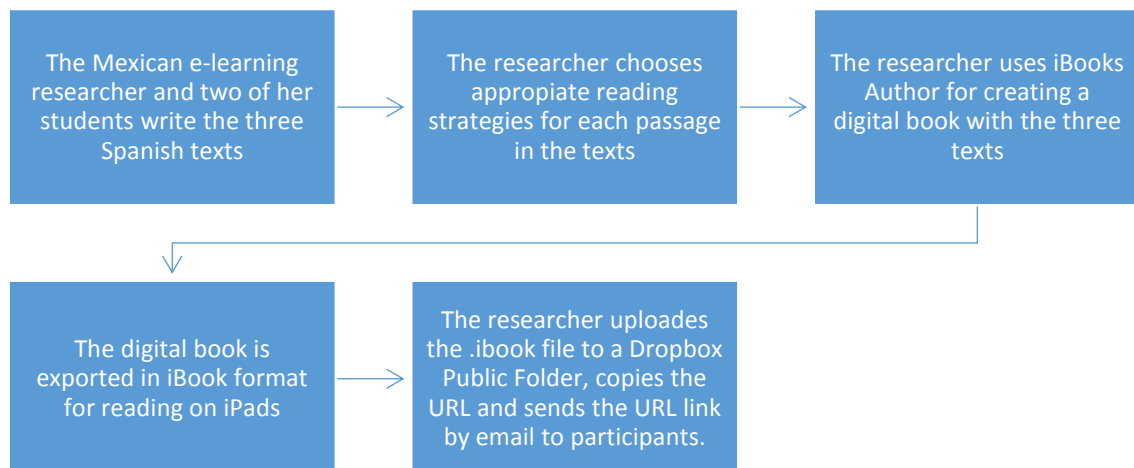| The digital book is exported in iBook format for reading on iPads	→	The researcher uploads the .ibook file to a Dropbox Public Folder, copies the URL and sends the URL link by email to participants.

Figure 12. The process of designing an iBook with the iBooks Author app
for promoting the use of reading strategies

4.5 Data collection methods

Using multiple methods for acquiring several perspectives on a situation is in accord with complexity theory (L. Cohen et al. 2011). In any case, triangulation of evidence collection is a prerequisite for employing a case study approach (Thomas, 2011). In order to ensure triangulation of evidence, information was gathered from multiple sources to address the research questions. Two verbal report methods were used to capture the participants' own words: semi-structured interviews and students' logs. In order to capture non-verbal communication, visual media was also used. Finally, the researcher recorded ideas and reflections in a researcher's log.

A lesson learnt from the pilot was that it was difficult to interpret the data when participants referred to the technology because it was not possible to see in the transcript the feature they were pointing at. Therefore, in the main study, I developed a method of data collection combining the use of three instruments at the same time: interview, observation and visual media. The decision on selecting

visual data was based on achieving a higher level of detail, using both verbal and non-verbal communication.

4.5.1 Semi-structured interviews

The conscious and unconscious thought processes students go through while reading in a foreign language provide crucial information on their strategy use Mokhtari & Sheorey (2002). In the field of learning strategies, interviews and diaries are rich sources for gaining access to students' behaviour. Mc Donough (1995) explains:

> the learner is asked for an account in a semi-structured or unstructured fashion about what he was paying attention to or observed himself doing while performing some language tasks like reading, writing, talking to people in certain ways, and even listening. (...) However, the value of both direct and indirect kinds of evidence is primarily the quality of the insights they afford, particularly into an individual's behaviour; moreover, some of these insights cannot be gained by any other means. (p.9)

He also emphasises the use of these methods of data collection rather than trying to reduce the phenomena of investigation:

> The point of studying such reports and perceptions of processes and activities in education is precisely to subject this mass of insights to scientific analysis and thereby acknowledge the richness of people's language-learning experiences, rather than reducing it to only those aspects which are amenable to study by particular experimental means. (McDonough, 1995, p.11)

This point of view is consistent with complexity theory, which guides this research.

Semi-structured interviews have the advantages of using a two-way communication. It is thus possible to obtain not only the answers but also the

reasons for the answers (Mason, 2002). Moreover, the only way to find out if participants are using reading strategies is to inquire of them (Chamot, 2004). Thus, the researcher can access hidden strategic activity through the reader's own words.

A method for collecting information on how students approach a language-learning task is the retrospective interview (Wenden, 1991). The researcher asks participants to think back to each time they performed a task and try to articulate their strategies. In a semi-structured interview, retrospective reporting is more focused (Wenden, 1991). One issue with this instrument is memory. Participants' reports on strategies will be less accurate the more time elapses between the actual task and the interview (Macaro, 2001). In this study, the type of interview was retrospective in that I asked students to think back to the time they had read the e-book and try to articulate their strategies. The issue of recalling strategies that had been used some time before the interview can be addressed by using a stimulus (Macaro, 2001). As a stimulus for improving the recall of strategy use, I asked students to switch on the mobile device and show me how they approached the digital texts. This stimulated participants to examine their reading behaviour. Based on students' performance, I feel this method of data collection might have enhanced the process of memory retrieval. One student mentioned, before starting an interview, that he remembered better how he had read the three texts if he switched on the iPad and opened the e-book.

Therefore, in order to collect evidence of students' strategic reading behaviour, I chose face-to-face retrospective semi-structured interviews for data collection. In order to elicit responses, I asked them to describe how they approached the three digital texts, so that they would verbalise strategies used in the past weeks. The structure of the interview moved from factual questions to set the interviewees at their ease to more focused questions on how they approached the reading process with iPads. The interviews covered the following areas:

- participants' learning experience in general, inside and outside the classroom
- their reading experiences in their mother tongue and in a foreign language

- participants' views on technology
- FL reading strategies used while reading with iPads
- technology-mediated reading (how the features of the iPad and the iBooks author application assisted reading comprehension)

The common core questions for answering research questions 1 and 2 can be seen in Appendix 5. The interview was of approximately 30 minutes duration.

In the interview strategy account it is crucial to include the following dimensions (Maxwell, 2013): 1) the context, 2) the cultural background, 3) the interview structure, and 4) type of questions.

1) Context

It is crucial to establish rapport in fieldwork since the quality of relationships has an impact on the quality of data (Ball, 1993). In School 1, I was the teacher and researcher (see

4.3.2 Ethics). From the start, there was an established positive relationship as a result of having taught participants in Spanish for a period of time. The informants trusted me and I trusted them as they had the loan of an iPad and I needed to get it back on time and in a good state. Informants' trust seemed to have had an impact on the richness of the data. They gave me very detailed accounts in the interviews. From the examples they provided in the interviews, I could tell that they had been very thorough in performing the 3 reading tasks.

In School 2, I was not the teacher. Participants in School 2 were not as approachable as participants from School 1 were. I could feel that students were a little reluctant to explain how they read the texts. I had read the informed consent and explained that the purpose of the research was learning about their reading behaviours with iPads. However, they appeared to answer my questions as if it was an exam. One factor was that it was necessary to hold the interviews in a corridor; maybe in a quieter place they would have provided more detailed accounts.

The quality of relationships influenced the data collected from School 2. The accounts are not so rich as in the cases of School 1. However, the descriptions the School 2 interviewees gave about the way they read FL texts with the iPads did provide information on the use of FL reading strategies and iPad features to assist comprehension.

2) Cultural background

In both schools, I conducted the interviews in Danish, which was the mother tongue of the participants except for one participant who was from Morocco. The reason for interviewing participants in Danish was to prevent comprehension problems and to foster communication. It was important that they could articulate their thoughts, and they did not have sufficient command of Spanish to be interviewed in this language. McDonough (1995) writes that mental events may be difficult to articulate and that for non-native speakers reporting in a less fluent language, articulating such events may become even more difficult. Danish is not my mother tongue, but I speak it fluently. I have lived in Denmark for 24 years, and I have taught courses at the University of Copenhagen where the language for teaching and communicating is Danish.

3) The interview structure

There is a relationship between the state of research in the literature review and the level of structure in the interview (Bryman, 2008). Previous research on learning strategies and reading strategies provided arguments to structure the interviews for research question 1. Regarding research question 2 ("Which functions of tablets facilitate the use of FL reading strategies?"), there was no prior research that could provide an argument to structure the interview questions.

Therefore, I adopted the semi-structured interview. It allowed me to follow the participants if they had something interesting to say about how the features in the iPad supported reading comprehension, and then return to the common core questions. Moreover, common core questions and a common structure allow

cross case comparison (Bryman, 2008), which is consonant with this multiple case study approach.

4) Types of questions

In a semi-structured interview, answers cannot be predicted as in a closed quantitative interview. Therefore, I was prepared with follow-up questions. Following Kvale's (1996) categorisation of questions in qualitative interviews, the types of questions used were:

- Introducing questions: e.g. "Please tell me about your experience with learning in general"
- Follow-up questions: e.g. "Do you mean that the reading process was slow because you had to switch away from what you were doing in your primary app "?
- Probing questions: e.g. "You just said that the green and blue speech bubbles embedded in the text helped to improve your comprehension. Can you give some examples of how they helped you to comprehend the text?"
- Specifying questions: e.g. "So what did you do, looking up words, anything else?"
- Direct questions: e.g. "Which functions in the iPad can support reading in a foreign language?"
- Indirect questions: e.g. "If someone had difficulty understanding a text, what advice would you give this student?"

4.5.2 Visual media

As mentioned above, the decision to incorporate visual data was based on achieving a higher level of detail by observing both verbal and non-verbal communication.

Even though some learning strategies are observable, much of the mentalistic information cannot be observed (Chamot, 2004). Some reading strategies are unobservable, for example, a student can use the strategy of planning, which is unobservable, to think about the steps to take for reading a lengthy article.

However, some strategies may be related to an observable behaviour, for example, highlighting to focus on the main ideas while reading.

There are references in reading research to the use of video material as an instrument of data collection (McTavish, 2008). For example, the use of stimulated recall interviews where participants are invited to recall, with the help of a video sequence with their own reading performance, what they were thinking during a past event.

In this thesis, video material was used <u>differently</u> to a stimulated recall interview. It was not a stimulated recall interview since participants were not asked to view a video with their own reading performance. They were asked to describe how they had approached the three recently completed reading tasks so that they would verbalise reading strategies. In this way, it resembled more a retrospective interview except that in the field of reading research retrospective interviews are audiotaped. By videotaping the retrospective interview, I captured the non-verbal data that audiotapes cannot record. Another advantage is that videotaping also captures details that the researcher might not be aware of and which are useful in detailed case study data collection (L. Cohen et. al, 2011).

Thus, this method provided a richer source of data; I had visual details together with the transcription since I had the visual data and the words uttered by the students. Moreover, it addressed a disadvantage of utilising interviews in strategy research: some participants may not be able to articulate their use of strategies (Wenden, 1991). By videotaping them, if they did not verbalise an observable reading strategy, I could see the strategy associated with the observable behaviour in the video (see Picture 1). Thus, it functioned as an observational method as well. In addition, I could check if what they reported about a certain strategy, for example, previewing, in fact corresponded with what the strategy of previewing a text entails.

Finally, audio-visual recording allows the researcher to view the record several times; the material is more comprehensive and the analysis is more complete (L.

Cohen et al. 2011). In particular, it addresses any tendency for the observer to focus on a single event and record only those events that occur frequently.

The issue of analysing both visual and verbal data was addressed with the use of the QSR-NVivo 9 software.

Picture 1. Video interview: A participant showing the strategy
of taking notes with an iPad

This research makes a contribution to methodology in the field of FL digital reading research by combining visual information, retrospective semi-structured interviews, observation and a stimulus for strategy elicitation to collect evidence of participants reading behaviour (see Figure 13). Since it is difficult to capture mental processes with observational techniques, I use them in conjunction with interviews. The issue of recalling strategies might have been addressed by the use of stimulus – asking students to show using the mobile technology where they had read the texts. Thus, the stimulus provided another dimension to the interview since I could both ask and observe at the same time. It could also

capture the gap between what the student reported on their use of strategies and what they actually did. I could observe how they had approached the reading tasks and I could corroborate the information from the interviews with the students' logs. Using this method of data collection, watching, listening, asking and recording at the same time, the quality of data was optimised.
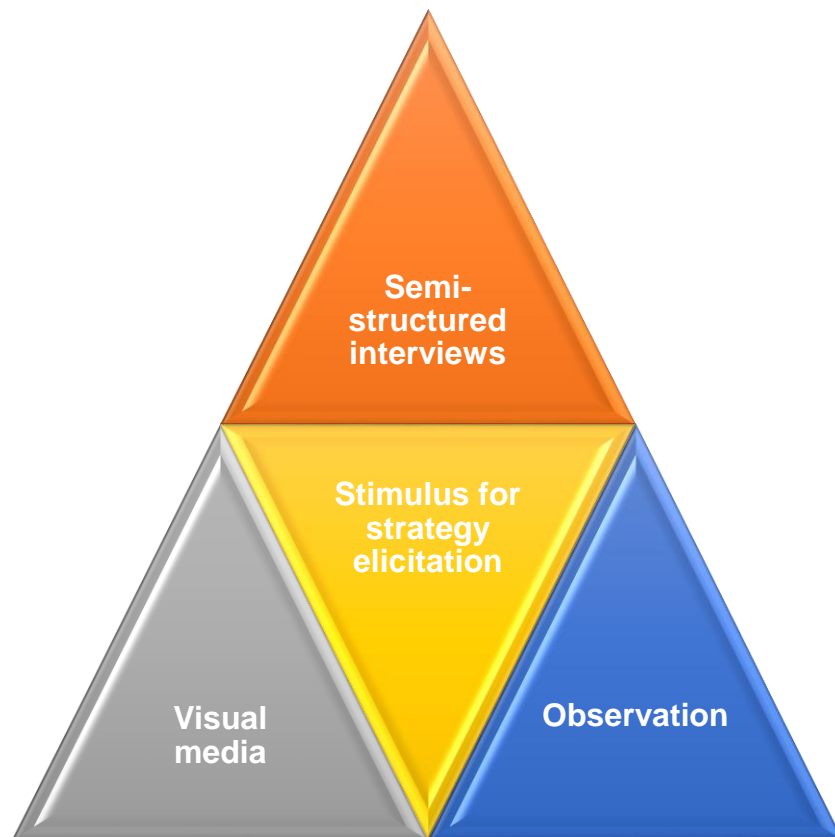

Figure 13. The data collection method developed for the study

4.5.3 Students' logs

In the educational research literature, the terms learning journals, logs and reflective diaries are often used interchangeably (Moon, 1999/2006). However, Moon (2010) explains the differences between these terms: a learning journal is a record of the learning; reflective diaries focus on reflecting on an experience; logs are "a record of events that have happened" (p.2). She goes on to say that all these concepts include the process of reflection.

I have chosen the term log because in this study students' logs are records of their use of reading strategies with the iPads over the three weeks. The logs were valuable in obtaining information. It is crucial to collect long-term data to determine what the reader does after the actual reading is finished (Pressley & Afflerbach, 1995). The logs also served to demonstrate the development of strategy use. From the perspective of complexity theory the focus is on change and how behaviour develops over time (Harshbarger, 2007). Therefore, I chose to collect data at different points in time.

Interviews capture what learners actually do better than questionnaires, but with students' logs the researcher can further access the learner's mental processes (Macaro, 2001)[15]. Moreover, they are "a powerful way to assess L2 performance and strategy use for multiple levels of proficiency and varied cultures" (Oxford, 2011, p.152)[16].

In order to encourage reflective writing (Moon, 2010), the student log for this study (see Appendix 6) included questions on: 1) strategies to understand the texts, 2) functions on the iPad that assist comprehension, and 3) completing a summary.

In the student's log, the students are asked, immediately afterwards having read the text to answer questions on how they approached reading. The report is then more closely linked in time to the reading task that is being reported. Thus, the issue of recency of interviews is addressed and the researcher has more certainty that the strategies reported were actually those being used (Macaro, 2001).

The purpose of including a summary in the student log was to check students' reading comprehension. Research on reading has shown that a summary reflects the reader's understanding of the text (McNamara, Ozuru, Best & O'Reilly, 2007). In addition, the summary is seen as a valuable tool to asses reading comprehension because it involves all of the three levels of reading

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[15] Macaro (2001, p. 59) uses the word "task-self report"
[16] Oxford (2011, p.152) uses the word "learner portfolios"

comprehension: the literal meaning, the inferential meaning and the evaluative meaning (Hauge, 1999).

Both the students' logs and the semi-structured interviews were in Danish so that a lack of proficiency in the foreign language would not be an obstacle for students when it came to describing their use of reading strategies (Chamot et al. 1987; Oxford, 1990).

4.6 Data collection

Data collection was conducted in four phases (see Figure 14). The first phase was the **pilot phase** (see Chapter 3). The second, third and fourth phases, which comprised the **main study,** lasted 10 months, from September 2012 to March 2013.

Fourth phase
School 2
March 2013
7 participants

Third phase
School 1
October 2012
3 participants

Second phase
School 1
September 2012
4 participants

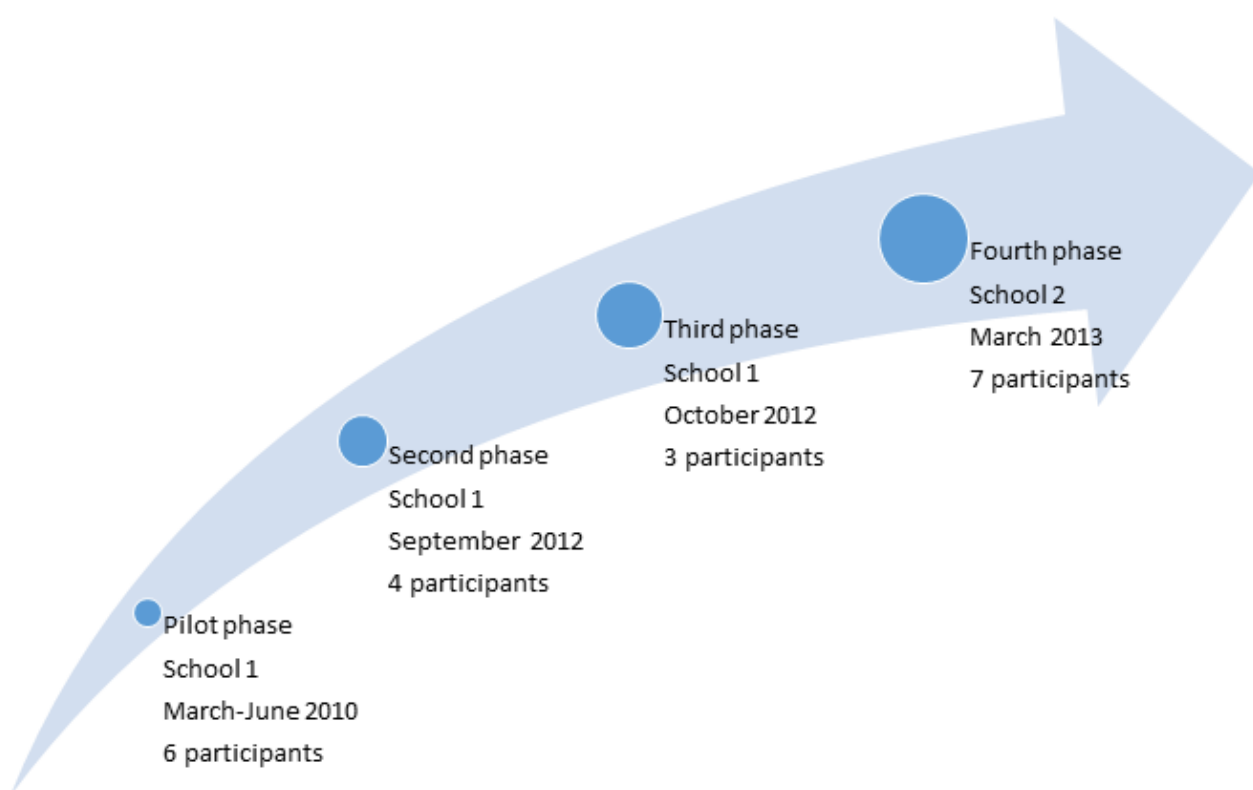Pilot phase
School 1
March-June 2010
6 participants

Figure 14. Stages in the data collection process.

The second phase took place on September 1st, 2012. In School 1, students were asked to go to the school library to borrow an iPad for 4-6 weeks. Once participants had signed the consent form, they met me, and I introduced them to the technology. I showed them how the hardware and the iBooks app functioned. I told them how they could look up the definition of words using a built-in Spanish dictionary (see Figure 15), highlight any word or passage of text within a book, create a note and review their highlights and notes by tapping the table of contents button. These features support important reading strategies: 1) Highlighting the text is a strategy that helps the students focus as they read and helps them identify the main ideas in the text; 2) Note-taking helps the students reflect on what they have read by asking questions about the text or checking comprehension as well as organising learning material.
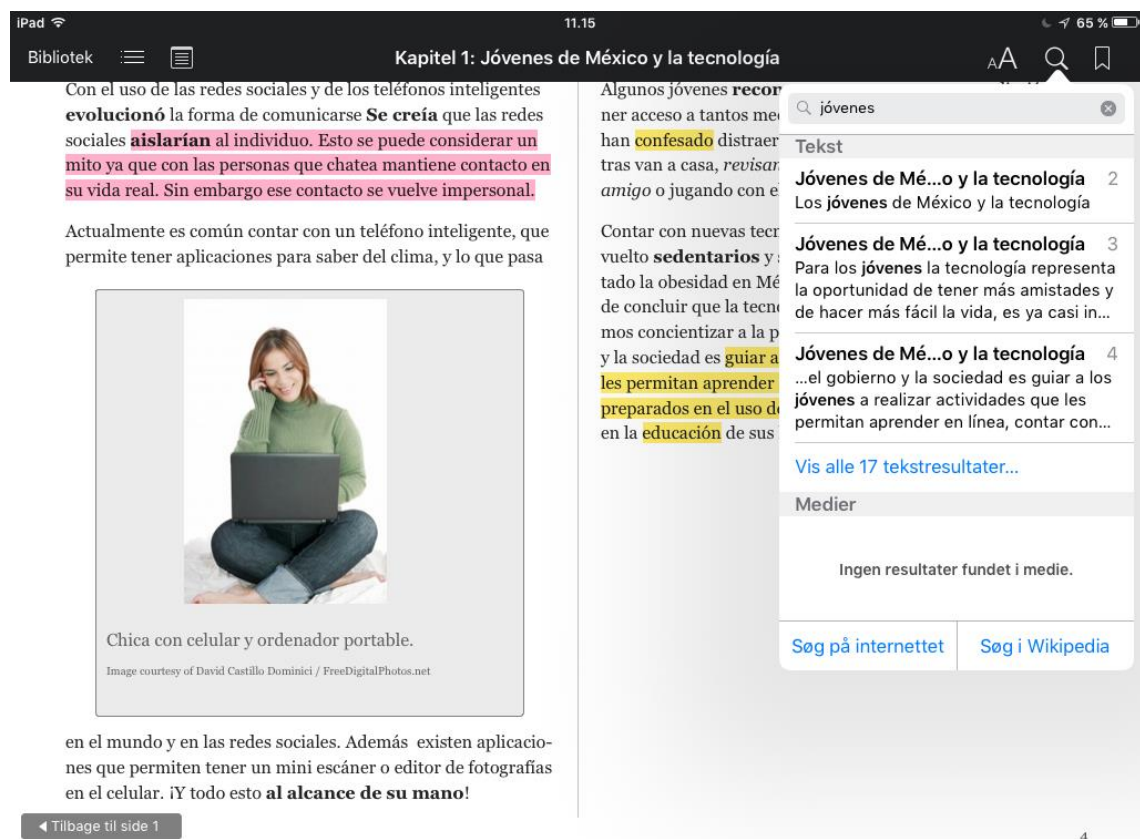

Figure 15. Reading tools: Highlight function and dictionary

I then showed them how to download e-books and e-materials for iBooks. I told them that they could download any other applications and materials they wanted. Finally, I showed them the e-book I had created for the study in the iBooks Author app.

The aim of the guided hands-on session was to give participants the opportunity to become acquainted with the functions of the tablet so they would be able to begin reading the Spanish material. Table 9 shows the steps I followed to prepare the e-book with the iBooks app and to get students acquainted with the functions of the iPads and the iBooks app.

Step	Description
A. Creating the e-book with iBooks Author application	The researcher created an e-book with 3 Spanish texts and scaffolds to support digital reading in a version that could be read in an iPad and shared with a link.
B. Guidance: 1. Introduction to the tablet 2. Setting up the iPad 3. Presentation of App Store and iBooks application 4. Introduction to the Spanish e-book with scaffolds to promote reading strategies and features supporting FL reading	The researcher introduced the technology, showing the students how the hardware and the software functioned. The researcher introduced the App Store to those students unfamiliar with Apple devices, and showed them how to download the iBooks application. The e-book with scaffolds to promote reading strategies was presented as well as the features in the app that supported FL reading.
C. Delivery	The researcher delivered the tablets to students

Table 9. Guidance on the use of tablets for reading

Students were asked to read the three Spanish texts (one per week). For each text, they had to complete a log (see Figure 16). In the logs, they recorded FL reading strategies and features of the iPads they found helpful for FL reading comprehension. To check if they had understood the text, they also had to summarise it. The reading activity and writing in the log was estimated to require one hour and half per week. The interviews were conducted the week after they had completed the three reading tasks (see Figure 16).

Reading task 2

Interview

- text 1
- log 1

Reading task 1

- text 2
- log 2

- task 3
- log 3
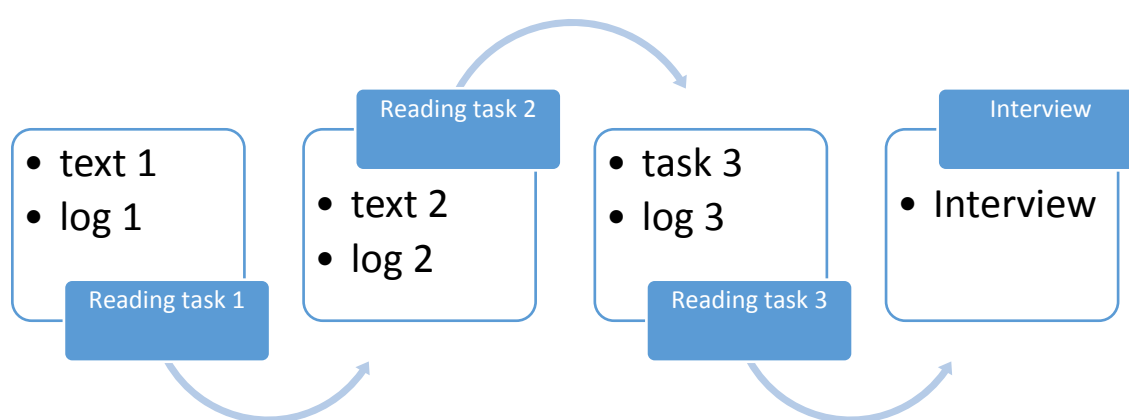
Reading task 3

- Interview

Figure 16. Administration of reading tasks, logs and interviews

The third phase took place on October 19th, 2012. The procedure was almost the same as the one for the second stage. The fourth phase took place on March 20th, 2013 in school 2. The procedure was different in school 2, since I was not the teacher. I met the students for the first time in their Spanish class after a short introduction by their teacher. Those who were willing to participate in the study came with me and we sat at a table in the class. I gave them the consent form to sign. Each student received an iPad for the reading tasks for a period of four weeks (on loan from the project). The school provided laptops to the students for use both in the classroom, and outside. Therefore, all participants were already acquainted with Apple's operating system and user interface. Thus, the students only required a brief introduction to the iPad. They configured the iPads quickly.

Then, they were shown how the iBooks application functioned: they were shown how they could look up words using a built-in Spanish dictionary and, for example, highlight any word or passage within the text, create a note and review their highlights and notes by pressing the table of contents button. Subsequently, students were instructed on how to download e-books and e-material for iBooks. They were told that they could use the iPads to download any other application and material they wished. Finally, they were introduced to the e-book created for the study.

Then, as in School 1, students were asked to read the three Spanish texts, to complete the logs and to summarise the texts (see Figure 16). Four weeks later, we met again in their Spanish class; they then came out from the classroom into the corridor where the interview took place.

4.7 Approach to analysing data

From a complexity theory perspective, findings were analysed looking at the totality of the phenomenon. I looked at both the resources within the learner – the reading strategies – and the resources outside the learning individual – the technology.

It is crucial to prepare data for analysis and this begins when the researcher designs the research project (Radnor, 2002). Before collecting data, I considered my research questions and I shaped the logs and interviews in a way so as to cover the main topic areas on which I wanted a response (see Appendices 5 and 6).

Whenever possible, interviews were videotaped with a digital video recorder. The video files containing the interviews were sent on a CD-ROM to another researcher with expertise in linguistics and the transcription was done by her. The interviews were transcribed verbatim. Since the focus of the study was on students' experiences and not on a linguistic analysis, filler words such as 'um' were omitted. The transcriber was requested to delete the data after transcribing.

Since the transcription was done by a person external to the research, I compared the transcription with the original video to check for possible mistakes. At the same time, it allowed me to become familiar with the discourse of the participants and in this way discover new elements for the analysis (Diaz Bazo, 2007).

I then imported the qualitative data, gathered from the semi-structured interviews and students' logs, into NVivo. The semi-structured interviews included the following data: the transcription, notes of the interviews (when it was not possible to record the interview), and the video files. Figure 17 shows the process of extracting the data for analysis.
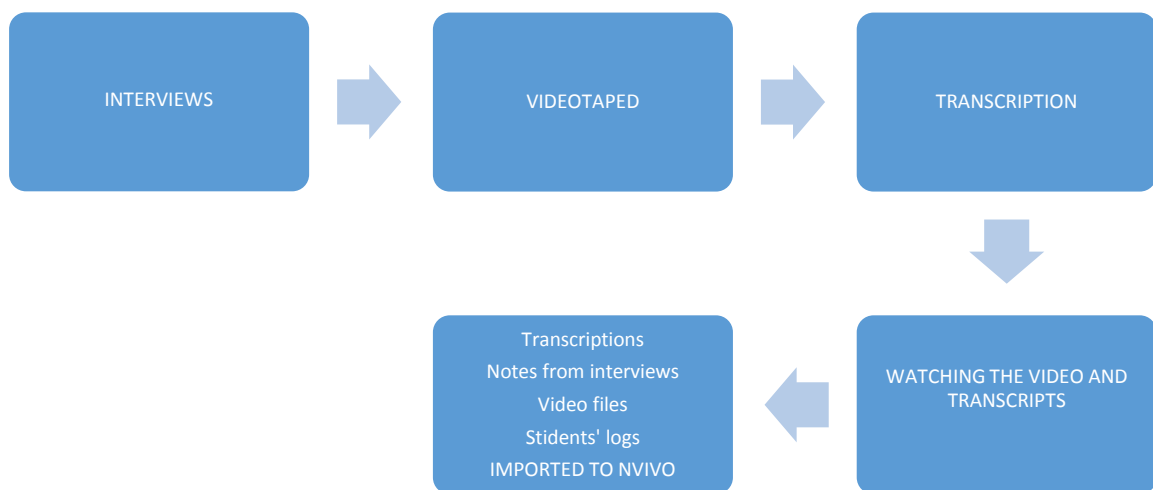

Figure 17. The process of extracting data for analysis

Once the data were imported to Nvivo, my approach to analysis was as follows:

Step 1: Interviews and logs were coded

Each semi-structured interview was labelled in order to distinguish between the 12 cases. Since there were 2 schools, a number (1 or 2) was added in front. The final coding is shown in Table 10.

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Instrument	Case	Participant	Code
Interview (video-recorded)	Case 1	P1	1VI Mette
Interview (video-recorded)	Case 2	P2	1VI David
Interview (video-recorded)	Case 3	P3	1VI Meriem
Interview (note-taking)	Case 4	P4	1I Tine
Interview (video-recorded)	Case 5	P5	1VI Osman
Interview (video-recorded)	Case 6	P6	1VI Peter
Interview (video-recorded)	Case 7	P7	1VI Lise
Interview (note-taking)	Case 8	P1	2I Laura
Interview (note-taking)	Case 9	P2	2I Emilie
Interview (note-taking)	Case 10	P3	2I Mathilde
Interview (note-taking)	Case 11	P4	2I Katrine
Interview (note-taking)	Case 12	P5	2I Sofie

Table 10. Interview coding

Table 11 shows how students' logs were coded.

Case	Participant	Code
Case 1	P1	1L Mette
Case 2	P2	1L David
Case 3	P3	1L Meriem
Case 4	P4	1L Tine
Case 5	P5	1L Osman
Case 6	P6	1L Peter
Case 7	P7	1L Lise
Case 8	P1	2L Laura
Case 9	P2	2L Emilie
Case 10	P3	2L Mathilde
Case 11	P4	2L Katrine
Case 12	P5	2L Sofie

Table 11. Students' logs coding

Some participants did not deliver the log (cases 2, 5, 11 and 12).

Step 2: Topic ordering process and constructing categories

Qualitative data gathered both from the semi-structured interviews and students' logs were coded and analysed using thematic analysis (Boyatzis 1998; Radnor 2002; Mason 2002) to identify categories and to combine categories into themes. The themes are reported in this chapter.

Data were analysed according to each of the two variables: 1) strategy use, and 2) functions in the tablet.

Research Question 1 in this study asked to what extent learners of Spanish use cognitive and metacognitive FL reading strategies with tablets. Data concerning Research Question 1 were analysed from the open questions in students' logs and the semi-structured interviews using a priori themes based on the existing literature. Thus, pre-existing categories were applied to the data using the list of learning strategies created by Oxford (2011). In this way the strategies revealed by students in the interviews and logs were classified.

Based on the research already reviewed, instances of strategies were identified with the tactics associated. Tactics are defined as "the specific manifestations of a strategy or metastrategy by a particular learner in a given setting for a certain purpose" (Oxford, 2011, p.31). For example, the following tactic "As I continue reading the short story in Lithuanian, I assess whether I was right in making a prediction that the main character would take a certain action" (Oxford, 2011, p.105) manifests the strategy of Monitoring Cognition.

Oxford (2011) provides examples of tactics representing a given strategy in the four FL skill areas: speaking, listening, writing and reading. In order to generate more examples of tactics associated only with the reading skill, I turned to Mokhtari and Sheorey (2002) for assistance. I used examples of reading

strategies from these authors (see tables 1 and 2 in Chapter 2). Categories were identified in this way in order to classify instances of similar strategic reading processes.

Under the category "metacognitive strategy use", there were different subcategories – among others, planning, monitoring and evaluating. These categories were then applied to the data. Some examples of the data under the category "metacognitive strategy use" are:

- Planning: "I read the title and have some expectations about what I am going to read"
- Monitoring: "I read slowly and look up the words I do not understand"
- Evaluating: "Normally, I do not write a summary after reading, but this time I have done it and it helped to understand the text"

The data regarding Research Question 2 (features of the tablet that facilitate the use of FL reading strategies) were analysed using different categories. Since there was little research on this question, categories needed to be developed. In order to construct categories, the following steps were taken based on Radnor's (2002) and Mason's (2002) analysis technique. The first step was to read the transcripts several times and list topics. In order to achieve this, it was useful to use the questions from the interview schedule, but it was also important to look for other topics from the transcripts (Radnor, 2002). Once the topics were listed, categories were found by reading the transcripts again. Categories were also informed by the research questions. A few trial categories were developed, for example, the construct that was explicit in the research question (reading strategies). Boyatzis (1998) points out that themes may be created deductively from theory and prior research. In the process of developing and applying categories, the research question was kept nearby while coding and cross-checked with the collected data (Mason, 2002). In this way, categories that emerged were noted. Categories were then allocated to topics.

Categories were listed according to the technological features of the iPad (note function, built-in search feature, etc.) and the construct explicit in the research

question (reading strategies). Thus, the features of the iPad were related to the particular reading strategies revealed by students in the interviews and logs. For example, the quote "*The highlighting function helps you to find the main points and to look back"* is an example of data under the category "highlighting" (iPad feature), which is associated with the cognitive strategy of Conceptualising Broadly (finding the central information in the text).

Step 3: Reading and watching for content

Once categories were identified, it was possible to code content to topic categories by reading the texts again, watching the videos, and highlighting quotes (see Figure 18). This process was facilitated by the qualitative data analysis software QSR-NVivo 9. The following extract from a video interview transcript shows the process of descriptive analysis.

Figure 18. An extract of a coded transcript of the video interview with P1

My analysis process is presented in diagrammatic form in Figure 19.
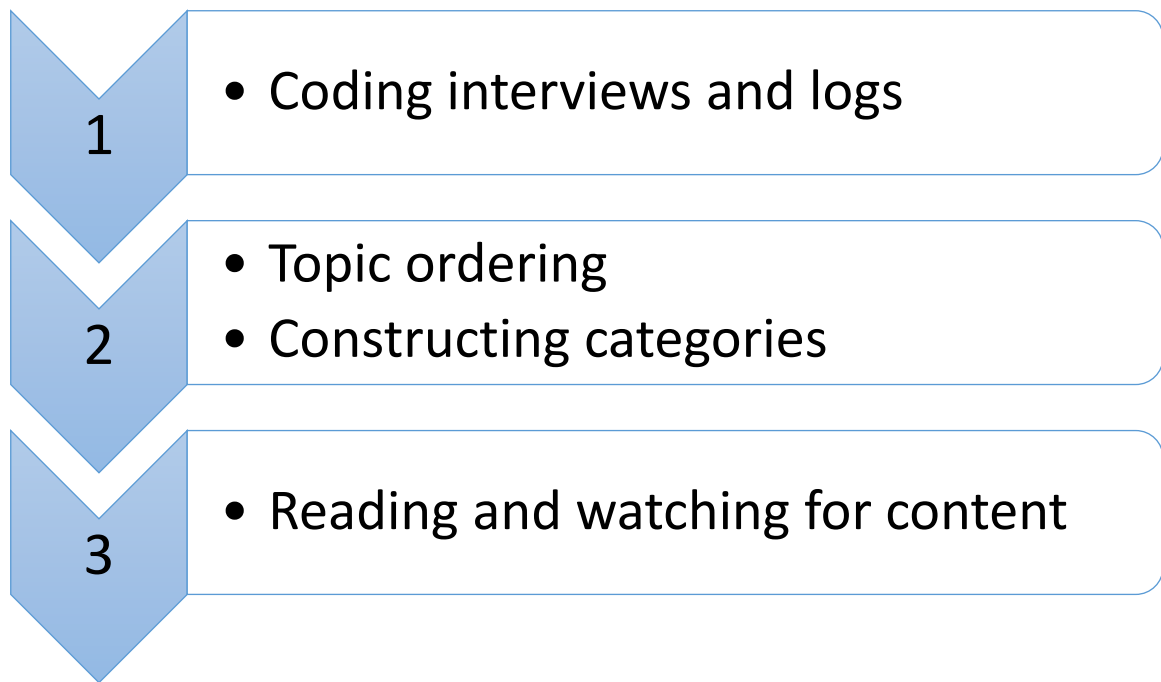
Figure 19. The researcher's analysis process of qualitative data

Coding assists in achieving the three aims of thematic analysis: 1) examining commonality, 2) examining differences, and 3) examining relationships (Harding, 2013). As mentioned above, in a multiple case study, the emphasis is on the comparison each individual offers with the others not on each individual case (Thomas, 2011). Therefore, I grouped instances from interviews and logs where they could be analysed for similarities and differences. In this way, overall patterns and themes were identified.

4.8 Validity, reliability and trustworthiness

Since this study was conducted in a natural setting, that is with real students in their real mobile learning context, the findings have high ecological validity (Bryman, 2008). Several strategies for enhancing validity were used according to Maxwell (2013):

- Intensive, long-term involvement: Coherent with complexity theory, this study collected data over a period of time.

- Rich data: In this research, multiple methods were used to assure rigor and depth of the scientific inquiry.

- Re-read data: I read the transcripts and logs and watched the videos a number of times to stay close to the data.

- Triangulation: I checked if the different instruments yielded the same results.

In addition, some of the techniques proposed by Harding (2013) to enhance validity were followed:

- I read thoroughly the transcripts before beginning the analysis.
- I kept a diary of thoughts and decisions about the interviews, while reading the transcripts, producing codes and reaching findings, to document how analysis developed (as described by W.J. Gibson and Brown, 2009).

 I have followed Radnor's (2002) principles of trustworthiness in detailing how the research was done; I have described in as much detail as possible, my role in the research, the type of data collected, how it was analysed, and the rapport between myself and the students. In so doing I have tried to enhance transparency in the research process.

4.9 Chapter summary: Methodology

This chapter describes how this study was conducted to identify: 1) foreign learning (FL) reading strategies that students use with tablets, and 2) the electronic features in tablets that may mediate FL reading strategies. The chapter argues for complexity theory – the research paradigm guiding this study. It then shows how the research design, methods and analysis are consistent with complexity theory. Theoretical guidelines based on Metacognitive Theory were applied to the design of prompts that promoted the use of reading strategies. These prompts were embedded in a digital book consisting of three Spanish texts. Data collection methods included interviews, logs, and visual data. The

approach to data analyse was thematic analysis. Validity and ethics were also discussed.

5 FINDINGS

In Chapter 4, I have argued for the decisions about the research paradigm, design, methods and analysis. In this chapter, I present the findings, analysis and interpretation of the collected data from the main study. In Chapter 6, I will discuss my findings with reference to the literature.

Data analysis can be presented in different ways, which may also be used in combination (Cohen et al., 2011, p.552) with the purpose of better answering the research question. In this chapter, findings are presented in the following ways: a) by cases; and b) by research question.

The overarching research question guiding this study is:

> *How can mobile technology mediate FL reading strategies?*

It has been addressed in this study using these two research questions:

> *1. To what extent do learners of Spanish employ cognitive and metacognitive reading strategies when reading with tablet computers?*
>
> *2. Which functions of tablet computers facilitate the use of FL reading strategies?*

From a complexity theory perspective, even though events do not occur exactly, broad patterns may be described (Kellert, 1993). Thus, a phenomenon is investigated by "asking about the general character of its long-term behaviour" (Kellert, 1993, p.3). The design of my study reflected this research paradigm and in this way it allowed me to observe the students' performance on a reading task at different points in time (one reading task per week for 3 weeks). Observing the development of reading strategies over time yielded interesting and unexpected results which have important implications for research and practice, as discussed in the Conclusion chapter.

5.1 Findings by case

This section presents an analysis of 12 different FL reading processes engaged in by students with mobile devices. The aim is to complete the picture that patterns associated with each research question (described in section 4.2 and 4.3) creates. Looking at each FL reading process reveals the details of how students approach the task of reading with the iPads and the impact on this has on their comprehension. Looking at the differences between the cases is crucial in a multiple case study and the comparison is more important than the individual (Thomas, 2011). The focus of the comparison is on the phenomenon – here, the reading process. In the following, I describe and compare the cases using participants' reports from the interviews and logs, and the researcher's log. Table 3.1 shows the codes that indicate the source of quotations. Pseudonyms are used for the presentation of all student data. The analysis of the data was performed in Danish (i.e. on the untranslated text). To provide evidence for the patterns found in the data, participant quotations were translated from Danish to English by the researcher. The focus was on content and not on language form.

At the interview, besides asking about the reading process with iPads, each participant was asked specific information, such as course, time of learning Spanish, years in Spanish speaking countries, Spanish relatives, goals in reading, time spent in reading, interest in reading, how they learn, and their views on technology. This type of information is useful for "contextualising people's answers" (Bryman 2008, p. 442).

Case 1: Mette

Case 1 learner was a woman who had 3 years' experience with Spanish. She had attended Spanish courses at school 1 for 2 years and completed "Spansk B" which corresponds to the B1 Common European Framework of Reference for Languages (CEFR) level. At the time of the study, she was not attending school but was taking private Spanish classes. She had travelled in Spain for 3 weeks.

Reading experience

In the interview, she stated that she enjoyed reading, particularly fiction and newspapers. She only reads novels in Danish; she has tried to read novels in a foreign language (English) but she thinks that she misses details. This shows that she is aware of her gaps in comprehension with a foreign language. Her approach to reading on the Internet is to focus on text-to-text connections. For example, when she reads a book she likes to search for information related to the book, e.g. historical facts. She has little experience with reading digital texts in Spanish. During the interview, she said, "When I booked my travel [to Spain], obviously I visited Spanish websites, but otherwise I do not do it [read digital texts in Spanish]".

Even though she has little experience with digital reading in Spanish, she employs the strategy of Activating Knowledge. She is able to find her personal connections to the digital text. When asked how she read the Spanish websites she answered:

> I think I cannot understand them in detail, but I can often understand the meaning of them. The main idea behind it, but it is of course also because they are websites that I look for, there is information I look for, so I know more or less what should be the content. It's something else if you just turn up at a random Spanish website and have no idea what will be the content, then I think it is harder to understand.

This last comment shows that she is aware of the effectiveness of knowing about the topic and reading-goals beforehand.

Learning Experience

In the interview, she reported that she did not receive instruction in learning strategies (LS) when she studied at school. Then, she stated the reasons for it, "it was not modern at that time". She continued explaining that only during the Spanish course last year (the researcher (myself) was the teacher) she received

some instruction in LS. It is interesting that even though she had very little instruction in LS, she is able to articulate in her own words the strategies she uses. For example, in the interview she uses the word "tactic" when she describes how she has learnt by herself to "better understand things". Or instead of using "Activating Knowledge" she used "these things we think we know".

Views on technology

She had an Android mobile phone but no experience with iPads before the study. If she had difficulties with the iOS system, she asked her son to assist her instead of looking in the iPad user guide. However, she found the iPad easier to open than the laptop. She also reported that the iPad was "very good for reading". She said that in a class it would be better to know the technology, in this case Apples product, before doing the learning task. She explained, "otherwise you use time on it [the technology]". The student's log reinforced this finding.

She also stated that she normally accessed the Internet from a laptop or stationary computer, not from her mobile. Regarding social media, she uses Facebook and YouTube. When asked if she played computer games she answered no, but later in the interview she mentioned that she plays Word Feud. The reason for this inconsistency might be that she has another understanding for the term "computer games" as meaning only "handheld game consoles".

Reading strategies with iPads

From the very beginning, she employed a wide range of reading strategies (see Tables 1 and 2) when reading the digital texts, such as having a purpose in mind, activating background knowledge, using digital reference materials to help understanding, using context for understanding a word, note taking, checking understanding while reading, analysing and decoding, comparing across languages, and reading aloud. However, instead of summarising the texts, which is a good strategy, she translated them literally into Danish.

When asked if the embedded strategies helped her to understand the texts, she answered. "I think I use them already (…) but it might have helped to be aware

of the way I read". This comment provides evidence of the ability of the app's prompts to raise awareness of reading strategies.

Data from both the interview and the log revealed that she approached the reading of the last text (text 3) in a different way. She explained that she ran out of time and that she guessed more than looked up words in the dictionary. She also noted that for the last text she used the laptop and the dictionary in the laptop and she took no notes. This confirms that she had been very thorough in the process of reading the two first texts. She thought that the summary of the third text might not be as precise as the other two, but that was not the case, her translation of the text was accurate.

The final task in the student's log was a summary. Mette noted in the log that she preferred to do a translation of the text because "she has read it several times". The translations she made show a good understanding of the texts.

Verbal report data revealed that she made very good use of the iPad functions when compared to other students who knew iOS well. For example, from the very beginning (text 1) she added notes in order to translate the unknown words. She also found on her own how to view notes (see Picture 2) in iBooks on the iPad.

Picture 2. Participant showing how to view notes in the e-book

She noted that this function was "rather ingenious". She elaborated that it was good for reviewing and that it could help her to remember better the unknown words. In the interview she also showed how she employed the search function (a search on the internet directly from the document) for looking up unknown words (see Picture 3).

Picture 3. Participant showing the strategy of
looking up unknown words with iBooks application

Moreover, she noted that the embedded strategies did not appear when reading with the iPad held vertically (portrait format); the embedded strategies only appeared when reading with the iPad held horizontally (landscape format). One can conclude that even though she had difficulties with the iOS system, she went into the technology thoroughly and explored the affordances.

An advantage of a mobile device such as an iPad is that you can take it anywhere; nevertheless, this participant used the iPad mostly at home.

When she read the Spanish texts with the iPad, she missed the ability to multitask. The log reinforced this finding. She wanted to have the dictionary and another window open with the e-book but this is not possible with an iPad. She noted that "it is a question of getting used to it". She accepts this restriction of the technology instead of considering how the technology should be improved.

She reported that she did not only use the iPad for reading the Spanish texts for the study. She also downloaded applications for printing (I-klar printing), for archiving digital documents (e-boks), for banking (danske bank). She had problems with Dropbox.

Case 2: David

Case 2 learner was a young adult man. David had learnt Spanish both in informal and formal settings. In the interview, he explained that his family comes from Chile and he had acquired the language by socialising with family and family friends. He stated that he could communicate in Spanish but was more confident with Danish. In order to complete his A-levels, he attended and completed a Spanish online course corresponding to the B1 Common European Framework of Reference for Languages (CEFR) level at School 1 during the course 2011-12.

Reading experience

In the interview, David stated that he does not read digital texts in Spanish. The only digital text he could think of was when he watches a Spanish film with his parents and there are subtitles. He loves reading, particularly biographies and books related to his studies. He his aware of using reading strategies such as scanning and taking notes. He is a strategic reader: He gave a detailed account of how he used them when reading and for which purpose.

Learning Experience

When I asked him how he learns, he said, "I actually use those techniques [embedded reading strategies on the e-book] that are on the iPad". During the interview, he used the word "technique" for expressing the concept "strategy". According to David, he learnt from a Danish teacher different speed reading techniques such as subvocalisation (reading moving the lips) and changing reading speed (reading fast, slow and fast). He also gave the reason why a particular technique should be used. For example, he explained that when you read only with your eyes, you may not notice a word or a letter, but moving the

lips or reading aloud "you avoid these mistakes". He added, "Some of these techniques are very useful".

Data from the interview indicated that David is aware of his learning process. In order to make sure that he does not forget the subject matter he has learnt, when he finishes a course, he reads the course material again. When he has to prepare for an oral exam, he records himself and listens to his presentation to see how long it takes to present. He noted, "It helps a lot to listen to your own voice". His preference for learning individually and in groups depends on the subject matter. He stated, "Now, I am taking a course in Mathematics and I do not like to study alone, I like to discuss it with others and listen to what they say". David is a self-regulated learner: he chooses the appropriate way to learn in a specific situation.

Views on technology

He had an iPhone so he was acquainted with the iOS system. He also had an Apple ID.
He reported that he uses his mobile "a lot" for searching for information on the Internet.
When asked if he used social media, he replied that he joined Myspace once but he stopped using it because he reflected on the advantages and disadvantages of having a social media profile and found that, "it is a waste of time (…) I prefer to concentrate on my studies".

Regarding the iPad, he had no experience with iPads before the study. He explained that before having it on loan for this study, a relative had bought one and he thought it was just a toy. Now he was very pleased with it because he could use it to search for information, to entertainment, to email, to write, to do homework. He thought it was a very good tool for learning. In the interview, he asked about the difference between turning off the iPad and putting the iPad to sleep. He also asked if it was possible to download apps such as Word and PowerPoint. He noted that it was an advantage to be able to look up words on the Internet by just pressing your finger on a word. He downloaded several applications because he considered buying an iPad after the study. He also

downloaded apps for his son. He admitted that he had read the texts in a hurry because his son had deleted the texts for the study by accident. This is corroborated by an email sent to the researcher: I had to send the link to the texts on week 3. He did not complete the logs. Nevertheless, data from the interview revealed that even if he had read the texts precipitately, he had a thorough understanding of them.

Reading strategies with iPads

When asked about his approach to reading the digital texts for this study, David asked if he could turn on the iPad, thus anticipating the researcher's request. He explained, "because then I remember a little better". He then explained that he started by reading the embedded reading strategies. But then he was in doubt as to what sequence to follow. He tried to orientate himself in the text by using the text structure of a newspaper where "there is a heading and a subheading, an introduction…" but he realised that "it [the digital text] is not built up in this way". This instance shows that he was trying to employ the strategies of setting a goal before reading and previewing the text. He tried to determine what to read and in what order, and previewed the digital text by noting organisation. Verbal report data collected indicated that he also employed activating background knowledge, and he used context clues to guess the meaning of unfamiliar words; these strategies are cognitive in nature.

When asked if he had looked for websites that covered other aspects of the topic, he explained that normally he puts the texts in perspective, but this time he had not done so because he was "under pressure because of his exams". Even though some strategies did not manifest because of time pressure, these instances provide evidence that he is not only a strategic reader when reading print texts, but with digital texts as well.

He noted that reading the three texts on the iBooks app was much better than reading a scanned PDF file. He mentioned as advantages the possibility of: 1) going back and forth; 2) zooming, and 3) pressing on words to look them up in the dictionary. However, he did not try as many functions of the iPad as Case 1

did. This could have been due to the lack of time resulting in not getting sufficiently acquainted wih the technology. When asked if he had added notes with the note option in iBooks he stated "I did not even know it was there, I have not had so much time to play with it [the iPad]". Nor had he noticed either the table of contents or the feature that allows searching throughout the book. Again, time pressure hindered this participant, not only in employing other strategies that he normally uses with print texts, but also trying other affordances of the tablet.

Case 3: Meriem

Case 3 learner was a woman from an ancient Spanish colony. She had 1 year of experience with Spanish as a foreign language. She had attended Spanish courses at school 1 for 1 year and completed "Spansk B" which corresponds to the B1 Common European Framework of Reference for Languages (CEFR) level. At the time of the study, she was attending school to take other subjects. After she learnt Spanish at school, she also took advantage of the possibilities of Internet. She reported that she spends much time listening to YouTube videos that her teacher recommended in the Spanish class. In this way, even though she was not taking a Spanish course, she was maintaining her skills in Spanish.

In the interview, when the researcher requested her to switch on the iPad, she answered that she had erased all the applications and the e-book. It was obvious that she had misunderstood the instructions. However, she was well prepared; for example, she brought notes with her and other related texts (see Picture 4 and Picture 5), so the interview provided rich and in-depth data.
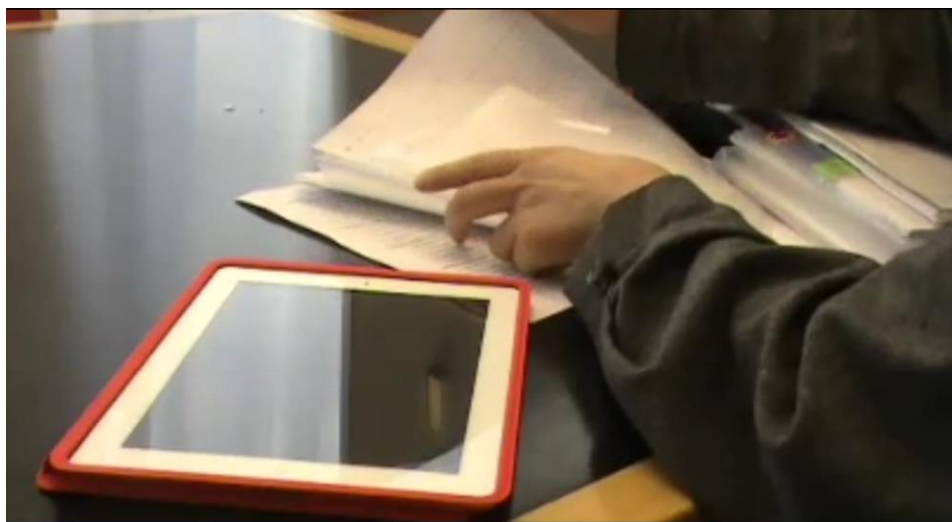
Picture 4. Participant 3, prepared with notes for the interview.

Reading experience

In the interview, she reported that she enjoys reading fantasy and history novels. She reads in Danish and Arabic. She reads websites in Spanish, most about learning Spanish. Her approach to reading in Spanish is understanding a paragraph at a time, checking understanding and taking notes. She looks up unfamiliar words in the dictionary and review them before the exam. These instances show that she monitors her reading: she checks her understanding before moving further. She is capable of strategic reading.

Learning Experience

In the interview, she stated that she loves learning new languages and she is very motivated to learn Spanish. She reported that she had never had opportunities for learning, and now that she has one she considers it a gift and wants to "learn more and more every day". Even though she stated she had not attended a course in study skills, she achieves good grades. When describing the Spanish pedagogical materials she accesses on the Internet, including video, transcription and exercises, she states "If you want to learn it, you learn it". This instance shows that she is an independent learner. She also takes the opportunity to learn anywhere, for example, she commented that she learnt a conjugation on the bus.

Views on technology

She had an Android mobile phone but no experience with iPads before the study. At home, she uses a stationary PC, at school a laptop. As with Case1, Meriem does not access the Internet via mobile, she uses it more for emails. She does not use social media either. She is fond of computer games. Amongst others she plays Minecraft and Word feud. She commented, as did Case 2, on the readability of the e-book. She mentioned as advantages: 1) it is easy to zoom in and out; 2) the clarity of pictures; 3) the ability to navigate forwards and backwards, and 4) it is fast.

She normally creates small podcasts for learning. She uses her sons' iPhone to record, listen and correct herself to improve her English. However, she did not use this feature with the iPad. She explains that she was afraid of doing this on the iPad because it is on loan and considered recordings of herself to be private.

She had difficulties with downloading applications for the iPad. She thought the iPad did not have a large enough memory or she did not know how to save things on the iPad. She used YouTube, the Google browser (Chrome), Apple's browser (Safari) and Educate tools. She wanted to read more magazines and article in Spanish from the iTunes store but she couldn't because she had to buy them. The fact that the iPad was not hers was also a hindrance to try more functions. She remarked, "I cannot relax".

Reading strategies with iPads

She approached the reading of the digital texts as a strategic reader: she previewed them by looking at the pictures first, then the headings and subheadings, and then moved on to each part of the text. Later in the interview, she reported that when a text has pictures they provide her with the overview, "the half of the story". She monitored her reading by checking her understanding; if there was an unfamiliar word she would look it up. She stated that there were many unfamiliar words. She started using Google translate but she stopped because it gave "strange meanings"; she then started using her dictionary on her

PC. Another way she monitored her understanding was by voicing the words as she read.

When asked about which functions in the tablet could support reading, she replied, "the bubbles [the embedded strategies] are extremely good". She was then asked to give some examples and explained that the strategies help her to understand the text without "the dictionary or Google". This instance shows that she employed the strategy of inferring with the help of the prompts in the bubbles. She also used reading strategies such as looking at other perspectives about the topic. She related the digital texts to other texts found on the Internet about the same topic. It is interesting to note that she read the texts found on the Web on paper (see Picture 5).
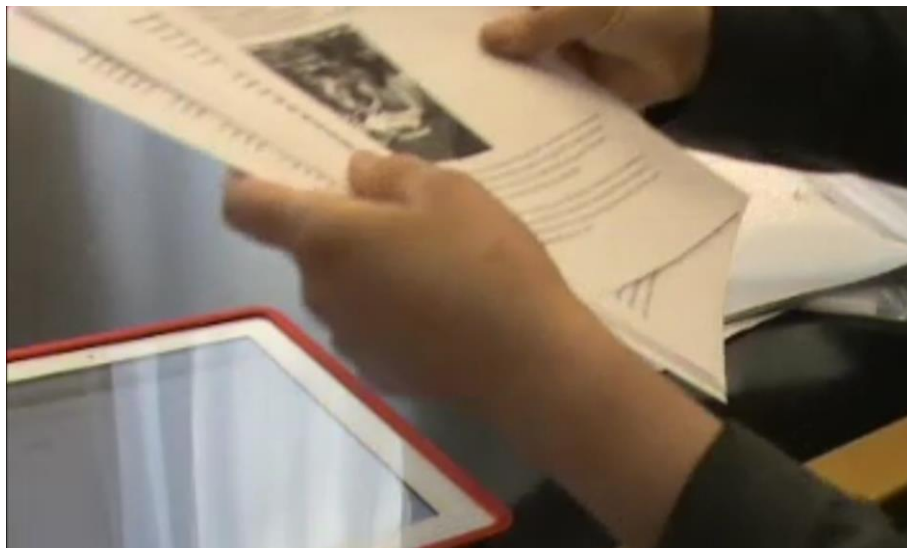
Picture 5. Print texts on the theme "Youth Mexicans" from the Internet

Regarding the mobile technology, she did not use the search feature for looking through the text. She mentioned that sometimes she had trouble with the copy and paste function in the tablet. She explained that if you were "real good" with technology, you could download documents and electronic materials from the stationary computer to the tablet, and in this way reading would be easier. From this comment, it is obvious that she did not get fully acquainted with the iPad.

Case 4: Tine

Case 4 learner was a woman who had 5 years' experience with Spanish as a foreign language. She had attended Spanish courses at school 1 for 5 years. At the time of the study, she was attending the school to take Spanish courses and she wanted to complete "Spansk B". She had travelled in Spain.

Reading experience

In the interview, she stated that she reads fiction and detective stories. She reads in Danish and in English. Her approach to reading is to re-read the text several times until she makes sense of the text.

Learning Experience

Data from the researcher's log indicates that she is able to articulate in her own words the strategies she uses, but she is not aware of the concept "strategy". For example, during the reading period she commented that "I do not use strategies, I just read the text several times". This comment shows that she employs the strategy of monitoring reading.

Views on technology

She is a Windows PC user and had no experience with iPads before the study. However, she was able to use the note and lookup functions, as described below. When asked if she used social media, she replied that she uses YouTube, FaceTime and Skype. Data from the researcher's log indicated that she had a technological issue with the iPad during the reading period: Due to a software update, she lost the e-book. This issue was repaired immediately by sending the link of the e-book again.

Reading strategies with iPads

In the interview, she stated that, before reading the digital texts, she asked herself if she knew something about the topic. Apart from using this strategy, Activating Knowledge, she also used: Monitoring Cognition, Obtaining Resources for Cognition, Using the Senses to Understand and Remember, Conceptualising

with Details and Conceptualising Broadly. In order to understand the texts, she stopped reading and went back. If she met an unknown word, she consulted different sources: a print dictionary, google translate, an electronic dictionary. She also read the text aloud and took notes to help with understanding. She translated the three texts into Danish. As with Case 3, Tine related the digital texts to other texts found on the Internet about the same topic.

An interesting finding was that Tine reported in the student's log of week 2 that she "has tried to guess the meaning of the word", just as Case 3 reported in the interview. The strategy of inferring is introduced in Text 1 which participants read in week 1. This finding again suggests that the prompts in the bubbles promoted the use of the strategies explained.

Even though she had translated the three texts literally into Danish, she also wrote the summaries. She reported that the three texts were difficult; however, the summaries in the student's log reflected that she understood the three texts well.

Data from the interview revealed that she utilised the note function for learning new words. She explained that after looking up a new word in the dictionary, she created a note with the meaning in Danish. In this way, she could review it when she read the texts again. The log reinforced this finding. She also wrote that she employed the highlight function to highlight words. Data from the interview and the student's log indicated that she found the iPad "slow" when she wanted to look up unknown word. In the student's log, she wrote that it was also "annoying" to have to exit the e-book when you wanted to look up a word. However, she valued the possibility of having different choices (search on the Internet and on Wikipedia) by just pressing on a word.

Case 5 Osman

Case 5 learner was a young adult man who had 1 ½-years experience with Spanish as a foreign language. He had attended Spanish courses for 6 months at an upper secondary school. He had attended school 1 for 1 year and

completed "Spansk B". In the interview, he stated that he devoted himself to learning Spanish because he will study this subject at the University.

Reading experience

He reads Spanish sports newspapers such as "Marca" and "As" with an application for the iPhone. He thinks it is easy to read when the texts relate to his knowledge about football. He prefers to read Spanish on his iPhone because it is easy to look up words with the help of digital dictionaries.

Learning Experience

In the interview, he stated that he does not like teacher-centred instruction. He prefers active learning: to be engaged with the learning material and work with it. He has taken a course in learning skills but he prefers to learn in his own way, as he puts it, "…my own techniques to do it [learn]". He considers that he has a good note-taking technique. When asked if he likes to learn with others, he answered that it is very exciting because you get other perspectives that you had not thought of. He sees value in sharing ideas and suggestions for how to go about a task.

Views on technology

Osman uses his iPhone a lot. He streams music with a music streaming service called "Whimp". He does not play computer games. Regarding social media, he describes himself as a "relatively active" Facebook user and adds that it might be "a bad habit". He uses a laptop for his studies and the stationary computer at school because it has more facilities.

Reading strategies with iPads

Osman did not read the texts over the 3 weeks – he asked for the link to the digital book some days before the interview. He did not complete the logs either. However, the account provided in the interview gave a rich picture of his experience of reading the e-book on the iPad. When asked about how he approached the texts on the iPad, he stated that, at first glance he thought that

they were a little bit above his level, but when he made time to read them they began to make sense. This shows that Osman is a strategic reader: when experienced difficulties, he employed the strategy of getting the main idea of the text instead of looking up every unknown word.

The next comment illustrate how he monitors his reading: "sometimes I can feel that it is a word that is important for my understanding …. and then I start to look it up". This instance shows that he checks his understanding, he is aware of when he has a comprehension problem and tries to solve it using another strategy. He did not take notes; he explained that it was a short text that he could remember. However, when the texts are longer he takes notes of the key words. He found the strategies about finding the theme (what is being talked about) and rheme (what is said about the theme) interesting. He stated that he did not know about it and he did not use it. Nevertheless, it is reasonable to argue that the prompt in the e-book has raised awareness of this particular strategy.

In the interview, he remarked that he does not find any difference between reading in print and on screen. The only thing he finds different is that the iPad has all the features (dictionary, note function) he needs in relation to his learning skills in one place. It is an interesting result in light of the debate over whether the print format is more effective for learning than the digital format.

Case 6: Peter

Case 6 learner was a man who had experience with Spanish. He had attended his first Spanish courses in 1978 at an evening school to prepare for travel to South America. He travelled for six months, learning Spanish there. He took a Spanish course at School 1, but he did not complete the level "Spansk B".

Reading experience

In the interview, he stated that he reads "a lot", particularly books about politics. Before participating in the study, he had never read a digital text in Spanish. During the study, he downloaded a Danish book and read it, but he did not download digital Spanish texts such as newspapers or books.

Learning Experience

In the interview, he reported that he had never received instruction in learning strategies (LS) or study skills. His view of learning reflects Vygotsky's model of learning: he thinks that dialogue is crucial for learning to take place. He also maintains that it is important to have a text to refer to, so that the sound-letter correspondence is visible.

Views on technology

He had an iPhone, but no experience with iPads before the study. He stated that he normally accessed the Internet from a laptop and, during the study, from the iPad. Regarding social media, he used to have a Facebook profile but he deleted it. When asked if he had had a technological problem with the iPad, he answered that he only had one issue: At the beginning, the embedded strategies did not appear when reading the iPad with the screen vertical (see Picture 6) – the embedded strategies only appeared when reading horizontally. He addressed this issue by reading the digital texts horizontally.
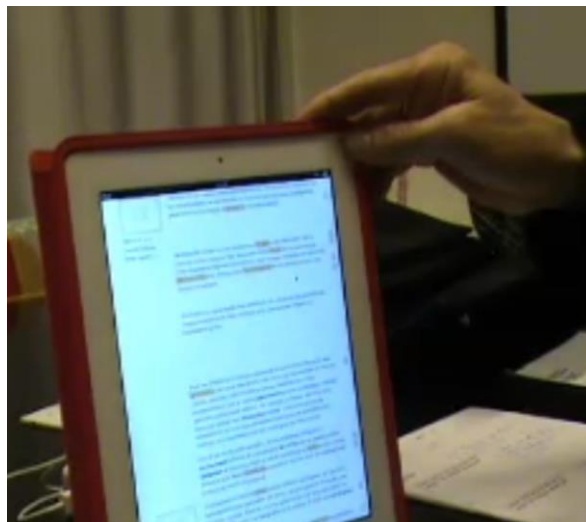
Picture 6. Participant showing how the embedded
strategies disappeared on the vertical screen

Reading strategies with iPads

When asked about how he had read the digital texts, he explained that he first read the text to get the main idea. He did not worry about the words he did not know. Then, he read the text carefully to understand the meaning precisely. He highlighted the unknown words and consulted the dictionary. He then created notes about these words to review them. He explained that when he encountered an expression which he did not understand he used Google translate. Similarly to Case 4, Peter employed a monitoring strategy, re-reading the text several times. He also recognised grammar using inductive reasoning.

Data from the interviews and the student's log show that he employed the strategy of inferring – he reads between the lines – and he localises the central information in the text finding the theme and rheme.

Both in the interview and in the student's log he reported that the texts were "rather difficult" and that it was an advantage that the electronic dictionary could be accessed from the tablet.

When asked if he had read the bubbles with the prompts, he answered that in the beginning he did not know what to do about them but he followed the instructions in the prompts. He stated that they help him to reflect about the text. This finding suggests that the prompts with examples of useful strategies promoted reflection.

The summaries he wrote in the student's log reflected a good comprehension of the texts.

Case 7: Lise

Case 7 learner was a woman who had 10 years' experience with Spanish. She explained that Spanish was a "continued interest". She had attended Spanish courses at school 1 and completed "Spansk B". She had travelled in different Spanish speaking countries.

Reading experience

In the interview, she stated that she enjoyed reading, particularly fiction and newspapers. She reads most newspapers and articles in Danish. She has read novels in a foreign language (English). She thinks it is crucial to understand the culture in order to understand a text in a foreign language. She had experience with reading digital texts in Spanish before the study, mostly Spanish tourist websites. When she does not know the meaning of a word, she Googles it.

Learning Experience

Her approach to learning is by concentrating to complete the tasks. In the interview, she reported that, as opposed to the young students today that learn about the learning process, she did not receive instruction in learning strategies (LS) when she studied at school. They "had to learn by themselves". When asked about her views on learning outside the classroom she answered that she mostly learns that way because of all the possibilities the Internet offers. She reported that mobile technology has enormous potentials for learning but she thinks it is also important to learn to write manually.

Views on technology

She has a mobile phone with no access to the Internet and no experience with iPads before the study. Similarly to Case 1, if Lise had difficulties with the iOS system she asked her son to assist her instead of using the iPad user guide. When she has to access the Internet, she uses her stationary computer.

Reading strategies with iPads

She employed a wide range of reading strategies when reading the digital texts such as skimming, activating background knowledge, using digital reference materials to help understanding, using theme and rheme to localise central information, comparing across languages, using inductive reasoning, note taking, checking understanding while reading, analysing and decoding, comparing across languages, and rereading. In the interview, she reported that she had not heard about rheme before the study. Later, she stated that she had employed the

strategy of finding the theme and rheme before the study but she had not used those terms. The strategy of highlighting and underlining theme and rheme were introduced in the last text (number 3) but this student already used it and applied it to text number 2. It is evident that she had read the text several times (confirmed by the researcher's and student's log) and she applied this new strategy to other texts. Similar to Case 5, Lise noticed the word "rheme" and the strategy associated with it with the help of the prompts incorporated in the e-book. The difference between the two cases is that Lise actually employed the strategy and found it useful. This finding is reinforced by the student's log and researcher's log. She found it "funny" to be able to voice what she actually does when she reads. This instance suggests, as other cases, that the prompts raised her awareness of her reading strategies.

Verbal report data revealed that she made very good use of the iPad functions compared to other students who knew iOS well. For example, from the very beginning (text 1) she added notes in order to translate the unknown words. She also used the technology to apply the strategies. For example, she found the highlighting function and applied it to theme, and the underlining feature to rheme. In this way, she found a way to focus on the main ideas in the texts with the help of the technology. She also employed the search function for looking up unknown words. As with Cases 1 and 4, when she read the Spanish texts with the iPads she missed the ability to multitask. Data from the researcher's log indicated that the lack of multitasking interfered with the student's short-term memory.

An interesting finding regarding the different purposes of the prompts in two languages is that Lise reported that they helped her to develop her learning strategy repertoire while at the same time learning a foreign language.

The summaries she wrote in the student's log reflected a good comprehension of the texts.

The following Cases, 8 to 12, are participants from School 2, which uses Apple hardware exclusively. The participants were not as motivated as at School 1; in School 2 I was not the teacher, only researcher, and the participants were not as

collaborative as participants in School 1. Furthermore, I was not able to videotape the interviews.

Case 8: Laura

Case 8 learner had 3 years' experience with Spanish. At the time of the study, she was completing a "Spansk A" course, which is an A-Level equivalent in Spanish and has a duration of 3 years. She had travelled in Spanish-speaking countries.

Reading experience

In the interview she stated that she enjoyed reading, but at present she does not have the time because of her studies. She had experience with reading digital texts in Spanish before the study, mostly websites.

Learning Experience

In the interview, she reported that she remembers a text best when she looks for main points in it. She also writes summaries in order to get the overall idea.

Views on technology

She is acquainted with Apple products, since she has an Apple laptop but she had no experience with iPads before the study. She uses the Internet for learning, for example, for looking up new words. She also uses social media.

Reading strategies with iPads

Data from both the interview and student's log indicated that she used background knowledge and skimmed the texts to get the main idea and help her to understanding the texts. In the interview, she reported that she used the pictures to get the "atmosphere" of the text. She guessed the meaning of unknown words by inferring from the context and by comparing with other languages. She also recognised grammar using inductive reasoning. Finally, she reread the texts to be sure she understood them. The iPad functions she used when she had problems with understanding were the built-in search feature of

the iBooks mobile application, for searching a word or phrase using the Internet, the glossary, for searching the meaning of the word in the e-book, and underlining. In the student's log she wrote that the glosses worked really well because "they were where you had to use them [in an overlay, so they had the definition instantaneously] not at the end of the document". She explained that the underlining feature helped in the reading process by locating the central information and by being able to look at it again.

Regarding the prompts in the texts, she reported that they made her focus her reading (each prompt had a description of a useful strategy for a particular paragraph). This finding suggests that the prompts promoted the strategy of Paying Attention to Cognition. She also remarked that she had employed some of the strategies before, but reading the prompts with the descriptions of strategies made her more aware of them. An interesting finding is that she read the texts differently. In the interview, she explained that as she read more texts she acquired more strategies. In this way, she approached new texts differently because she had learnt strategies from the previous texts. This finding suggests that the prompts facilitate strategy learning.

The summaries she wrote in the student's log reflected a good comprehension of the texts.

Case 9: Emilie

Case 9 learner had 2 years' experience with Spanish. At the time of the study, she attending the second year of a "Spansk A" course, which is an A-Level equivalent in Spanish and has a duration of 3 years. She has never travelled to Spanish-speaking countries.

Reading experience

In the interview, she stated that she read novels, detective stories and science fiction. She had experience with reading digital texts in Spanish before the study, mostly websites.

Learning Experience

In the interview, she reported that she prefers teacher-centred instruction. Contrary to Case 5, she likes it when the teacher explains subject-matter using the whiteboard. She had not received instruction in study skills.

Views on technology

She has an Apple laptop but she had no experience with iPads before the study. In the interview, she stated that she finds technology useful for learning. She elaborated by saying that she uses the Internet for looking at different perspective on a topic and added "but you have to check the sources". She also uses social media.

Reading strategies with iPads

Data from both the interview and student's log indicated that her approach to reading was to read the text first without stopping or translating. She would then read the text again slowly, looking up the unknown words in her electronic dictionary on her laptop (not on the iPad). In the interview, she also reported that she employed an app for conjugation of verbs. She noted that she used the title to anticipate the information to come and guessed words from the context. She added that she read aloud to help with understanding and used Google Translate to check the pronunciation. She admitted that she did not read the prompts with the description of reading strategies.

When asked which functions of the iPad she used to help her understanding the texts, she answered that "she did not familiarise herself with the iPad". The student's log reinforced this finding. In the interview, she elaborated that she preferred to use the iPad as a "book" and use her Apple laptop to look up words. However, in the student's log she wrote that she found it easier to read and navigate on the iPad. This instance is similar to Case 2 who had not tried the functions of the iPad but noted some advantages regarding readability and navigation in the e-book. This finding suggests that students need to learn both the technology on which they read and the reading strategies.

The summaries she wrote in the student's log were not thoroughly elaborated but reflected a fair comprehension of the texts.

Case 10: Mathilde

Case 8 learner had 3 years' experience with Spanish. At the time of the study, she was attending the second year of a "Spansk A" course, which is an A-Level equivalent in Spanish and has a duration of 3 years. She had travelled in Spanish-speaking countries.

Reading experience

In the interview she stated that she enjoyed reading, especially detective stories and novels. She had experience with reading digital texts in Spanish. She commented as Case 2 that PDF scanned texts were "bad" for being read.

Learning Experience

In the interview, she reported that she learns best by reading the texts to be discussed in class individually, then by listening to the teacher presenting them, and finally discussing them. She had not received a course on study skills.

Views on technology

She has an Apple laptop but she had no experience with iPads before the study. She uses the Internet for learning, for example, for looking for information. She also uses social media.

Reading strategies with iPads

Both data from the interview and student's log indicated that she first read the digital texts once without looking up words, then a second time looking up the unknown words in her electronic dictionary. In the interview, she added that she used context and comparing between languages to guess unknown words. She read the texts aloud to help her understanding. Interestingly, she reported that she did not normally write a summary, but she did this time, as it was an activity

in the student's log, and she found it helped her to understand the text. In this way, the tool of data collection, the student's log, did more than collecting data, it made the participant aware of another important strategy, namely, summarising.

When asked which functions of the iPad she used to help with comprehension, she answered that the multifunction button worked very well for switching from the e-book to the electronic dictionary. She explained that when she encountered an unknown word she would use an electronic dictionary, which she accessed via Internet. She realised that she could use the multifunction button to switch quickly between the two applications (iBooks and the Safari web browser). Similarly to Case 1, she discovered this function by herself. However, in the student's log, she wrote that in spite of the multifunction button it was cumbersome to multitask[17]. She admitted that she did not read the prompts containing the reading strategies. Similarly to Cases 2, 3, and 9 she had positive comments on the readability of the iPad.

The summaries she wrote in the student's log reflected a fair comprehension of the texts.

Case 11: Katrine

Case 11 learner had 2 years' experience with Spanish. At the time of the study, she was attending a "Spansk A" course, which is an A-Level equivalent in Spanish and has a duration of 3 years. She had travelled in Spain. The researcher had to send her reminders to find a date for the interview and to deliver the iPad. In the interview she was not very collaborative.

Reading experience

In the interview, she stated that she enjoyed reading, especially detective stories. She had experience with reading digital texts in Spanish before the study, since the Spanish textbook used for the course was digital. It is interesting to note that

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[17] At the time of the study, the iPad could not really multitask (work with two or more windows at the same time), only switch between applications

respondents 8, 9 and 10 did not mention the textbook when they were asked if they had read Spanish digital texts before; the only mentioned Internet texts.

Learning Experience

In the interview, she reported that she learns best when she works at her own pace. She added that it is important to her to study in peaceful surroundings.

Views on technology

She has an Apple laptop but she had no experience with iPads before the study. She uses the Internet for learning, for example, for reading information. She also uses social media.

Reading strategies with iPads

When asked how she approached the texts she answered that she tried first to find out what the text was about. She guessed the meaning of unknown words by inferring from the context. She found the iPad useful because of the ability to use different applications. She added that it was very convenient for working at school. Katrine did not deliver the student's log in spite of the reminders sent by the researcher.

Case 12: Sofie

Case 12 learner had 2 years' experience with Spanish. At the time of the study, she was attending "Spansk A". She had travelled to Spain.

Reading experience

In the interview she stated that she does not like reading. She had experience with reading digital texts in Spanish before the study: she mentioned PDF files.

Learning Experience

Similarly to Case 5, she reported that she prefers active learning. She explained that she learns best by engaging with the learning material and working with it.

Views on technology

She has an Apple laptop but she had no experience with iPads before the study. She uses the Internet to search for information and for learning Spanish. She reported that she find technology useful for learning Spanish since she can consult electronic dictionaries and learn with websites such as "mere spansk" (more Spanish).

Reading strategies with iPads

When asked how she approached the digital texts, she answered that she previewed them to get the main idea. Then she reread them several times. When she encountered an unknown word, she guessed its meaning by inferring from the context and by comparing with other languages. The function in the iPad that she used when she had problems with understanding was the built-in search feature of the iBooks mobile application for searching a word or phrase on the Internet. She admitted that she did not read the prompts containing the reading strategies. Sofie did not deliver the student's log in spite of the reminders sent by the researcher.

Summary: Findings by case

All 12 cases demonstrated some use of deep processing strategies – cognitive and metacognitive strategies in the S²R Model – when reading the Spanish texts on the iPads. The use of cognitive strategies resulted in participants activating knowledge, using inductive reasoning to figure the grammar rules in Spanish, localising important information in the texts, looking at the accompanying pictures, highlighting, taking notes, skimming, predicting and inferring. The use of metacognitive strategies resulted in participants focusing in specific structures, setting a reading purpose, using print and electronic resources to understand unknown words and structures, rereading the texts and relating the information to other texts. These findings indicate that they were capable of strategic reading on screen. Most cases were also strategic readers when reading print texts.

Regarding the use of functions in the tablets to help understanding, most cases employed the built-in search feature when they encountered an unknown word.

Other cases employed useful functions such as note-taking, highlighting, underlining and the glossary. No participant reported using either the table of contents or the feature that allows searching throughout the book.

The interesting point in the comparison between cases is that the fact of being acquainted to the iOS system did not result in participants making more sophisticated use of the electronic features of the iPad to support comprehension. In fact, Cases 1 and 7, who were PC users, were the ones that found advanced ways of supporting digital reading processes, such as underlining the rheme and highlighting the theme, with the assistance of electronic features.

Another interesting point is that in some cases the feature "Shapes" promoted reflection about reading, which resulted in participants applying the strategies described to other texts. In other cases, it raised awareness of existing strategies.

5.2 Findings by research question

This section is structured around the research questions based on R. Brown's (1996) and Cohen et al.'s (2011) advice. They explain that it is a very convenient method of organising the data since it makes the process of exploring patterns across different types of data clear (Cohen et al. 2011, p. 552). R. Brown (1996) also argues for this method of organising the analysis since it will prevent the researcher from being too fond of the data.

Although participants' use of strategies was not exactly the same, broad patterns may be sketched, as suggested by complexity theory (Kellert, 1993). In this chapter, I present patterns of results and analyse them for their relevance to the research questions.

The study examined the use of strategies, as reported retrospectively by students in: 1) their logs, where they recorded FL reading strategies and features of the iPads they found helpful for FL reading comprehension, and 2) semi-structured interviews, where they were asked about their approach to reading with the iPads.

The analysis of the data was performed in Danish (i.e. on the untranslated text). To provide evidence for the patterns found in the data, participant quotations were translated from Danish to English by the researcher. The focus was on content and not on language form.

The reader might wish to link sections 5.2 and 5.3 below to the twelve cases presented in section 5.1. Table 10 and Table 11 show the relationship between the codes assigned to the interviews and logs and the twelve cases. The number before the case refers to School 1 or 2. A letter represents the source of data (I and VI refer to interview and videointerview respectively; L refers to students' log). For example, in the code "2I Laura" the number 2 designates School 2, I refers to the interview and Laura to case 8.

5.2.1 RQ1 Cognitive and Metacognitive Reading Strategies

In both schools, similar results were found. Table 12 and Table 13 show the cognitive and metacognitive strategies, as defined by Oxford (2011), identified in the interview data and students' logs.

5.2.2 Cognitive Reading Strategies

Data from students' logs and interviews suggest that collectively participants used the following cognitive reading strategies to extract meaning from the texts: 1) Using the Senses to Understand and Remember, 2) Activating Knowledge, 3) Reasoning, 4) Conceptualising with Details, 5) Conceptualising Broadly, and 6) Going Beyond the Immediate Data.

1. Using the Senses to Understand and Remember

One student expressed reliance on the auditory sense to understand. She remarked in the interview that she read aloud to help her understand the text. Another participant used the strategy of extracting information from illustrations and photos. The information she extracted was useful for getting the feel of the text. She used this to check her comprehension, "you get the ambiance of the text [from the images]. It helps when you have understood." (2I Laura)

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2. Activating Knowledge

Some students expressed reliance on background knowledge to assist comprehension. For example, one story to be read was about Mexicans and technology use. A student explained that her background knowledge on technology facilitated her reading comprehension: "I use my own knowledge of technology, so it was easy, actually." (1VI Meriem)

Another student explained how she used everything she already knew about the topic to understand the text:

> and then, the next it is obvious to put it in context with what I already know, that is. I thought about what I had learnt from the entire language course I took with you, where I tried to find some data also about Spain and Mexico, we've also travelled there, and from newspapers and everything else. (1VI Lise)

Verbal report data captured students' linkages between new material and what they already knew. One student expressed in the interview, "I used the title; I had some expectations of what it will be about, the youth" (2I Emilie)

3. Reasoning

The use of the strategy of reasoning resulted in some participants recognising grammar inductively or deductively. When asked if she used grammar rules in order to understand the text, a student answered, "Yes, of course, both verbs and conjugation of verbs and things like that." (1VI Lise)

4. Conceptualising with Details

A number of students utilised the strategy of conceptualising with details. This strategy was used in a variety of ways, such as note-taking and comparing across languages. "So I spent a lot, at least at the beginning, to create a note of these words (...) how they should be translated." (1VI Mette). This example illustrates how the student uses note taking for learning new words.

Within this cognitive strategy, students found different ways of guessing unknown words, including comparing languages, word morphemes, and context. For example, a student showed the ability to compare and contrast the two languages in order to infer word meaning, "You should always see if it [the Spanish word] looks like English, and it actually does a lot of times." (1VI David)

Another student used four different languages, Latin, French, English and German to infer word meaning, "Yes, linguistically! Yes, both Latin and French, and also English, of course, German, and it makes some of the words look familiar, and in this way I can guess." (1VI Lise)

Students' logs reinforced this finding. For instance, a student explained how she was able to infer word meaning using her knowledge of English, "I have deduced the meaning of the words from my knowledge of English." (1L Mette)

When asked what they did when they encountered an unknown word, a student stated, "I guessed words using the context. I also used English; it is a transparent language [a similar language to Danish]." (2I Mathilde)

Another student used morphemes to infer the meaning of an unknown word, "I used conjugation in order to see the tense." (2I Laura)

5. Conceptualising Broadly

A number of students utilised the strategy of conceptualising broadly. For instance, one student stated that she had skimmed the text quickly before reading to get the main idea, "I have read the quick to get an overview of text." (1L Lise) Some students employed the strategy of skimming to take an overall view of the digital text. One student stated, "I read the whole text without stopping I did not translate." (2I Emilie)

6. Going Beyond the Immediate Data

This strategy was utilised in different ways such as predicting and inferring. One student mentioned that his prediction about the text was based on the title of the

text. In this way, he easily predicted what the text would be about, "Well, I first thought, ok, "Los jóvenes de México y la tecnología", well, it must be about young people in Mexico and technology, and then I read further." (1VI David)

Another student used the strategy of making predictions to assist comprehension of the FL digital text. In the following quotation, she explains how she uses information – in this case the title of the text, to anticipate what she is about to read, "I read the title and I expect that the text is going to be about the youth in Mexico." (2I Emilie)

From the above quotation it is evident that the student is actively engaged with the text.

A number of students employed the strategy of inferring. Verbal report data collected indicated that they used linguistic clues to help them understand the meaning of what they were reading. The follow statement shows how a student uses information outside the immediate word to support comprehension: "Mainly, I also understand what the meaning is from the sentence. It may be that I do not understand the word exactly, but I can understand the meaning." (1VI David)

The above quotation illustrates that the student succeeds in grasping the meaning from the context without using a dictionary.

Both the interviews and the students' log data indicated that the students used inferring to elicit meaning, "I guessed using the context." (2I Sofie); "I used background knowledge to guess the meaning of the words. (2L Laura)

The table below shows a summary of cognitive strategy use.

Cognitive strategies in the S²R Model	Cognitive reading strategies identified in the data
Using the Senses to Understand and Remember	Reading aloud Extracting information from illustrations and photos

Activating Knowledge Conceptualising Broadly	Using prior knowledge
Reasoning	Recognising grammar rules inductively and deductively
Conceptualising with Details	Identifying the main points Taking notes Underlining and highlighting to organise the information Applying linguistic knowledge of other languages to the target language
Conceptualising Broadly	Skimming
Going Beyond the Immediate Data	Predicting Inferring

Table 12. Cognitive reading strategies identified in the data.

5.2.3 Metacognitive Reading Strategies

All students engaged in higher thinking skills: they reflected and monitored their understanding while reading texts in Spanish on their iPads. Students reported using the following metacognitive reading strategies:

1. Paying Attention to Cognition

A number of students reported using this strategy by deciding in advance to notice particular details and to pay attention to what they read in order to focus on the passage at hand. One student stated, "and then I started reading it more closely so that I knew exactly what was written." (1VI Peter)

Another student explained:

> I read a paragraph (...) and see if it makes any sense. Yes, if the paragraphs are too long then it might be just a sentence or if it is a difficult sentence to start with so it may well be I stop at the sentence so I kind of say "hey what is this really about? I read a paragraph or sentence and try to get an idea of what the text

says here, and so eh, so I look up words that I am in doubt. (1VI Mette)

2. Planning for Cognition

The following quotations from the participants show they had a purpose in mind when they read the digital texts, "First I read the text with all the words I could not understand, and got an overview of what the text was about." (1VI Peter). "But, well, what is it about? That is to say ... a quick impression of what this is all about, so I try, I think I skim the text to start with and find out what it is about." (1VI Lise)

The statements above from the students show that they decided to skim the text to understand the key idea. The importance of using the strategy of setting a purpose for reading and the impact on reading comprehension will be discussed in the next chapter.

Another student thinks about how text features can help him in understanding the text before reading it:

> These [the bubbles] are very eye-catching, so I actually think I read these first because I was a little in doubt, you know, for example, when you open a newspaper, and there is an article, there is always a headline, and then there is a small headline, where there is an introduction (...), and then comes the article. (1VI David)

This example reflects the important metacognitive strategy of noting text characteristics before reading.

3. Obtaining and Using Resources for Cognition

Both the interview data and the students' log data indicate that students frequently used online dictionaries and electronic translation tools such as Google Translate to determine the meaning of words they didn't understand.

They used more technological than print resources. The fact that the iPad could not show multiple windows was an impediment to learning an unknown word.

> when I looked up on Google, I could be in doubt in which context [the word] was [in the e-book], and then I had to go back [to the e-book] to see what was written before or after [the word], that might help to understand it [the word]. (1VI METTE)

This example illustrates how looking up words may interfere with the student's short-term memory. The contextual information about the new word she has just looked up is lost due to the fact that the iPad does not multitask.

Another student stated that the use of the electronic translation tool, Google Translate, did not help her to understand what she read, "I used Google translate (...) but I did not understand the whole, because Google does not give (...) the right meaning." (1VI Meriem)

The same student identified and found digital articles about the topic from another perspective. This is an advanced way of reading – extracting and synthesising information from different points of views. When asked if she had looked for sites that covered both sides of the topic she stated, "Yes. I have, in fact I have copies of them [articles related to the topic], but I do not know if [...?] it was very interesting." (1VI Meriem)

This example serves to illustrate that the strategy of Obtaining Resources for Cognition can be used in a variety of ways and at different levels. It can challenge the student's comfort zone by reading more complex information and synthesising it.

Data collected by the students' logs also showed that the strategy of obtaining resources for cognition was employed. For instance, one student indicated:

> I have made great use of different online dictionaries; among others, Gyldendal dictionaries are very good. Google Translate

functions for whole sentences too; you do not get the correct translation but just more or less an understanding of the sentence. (2L Emilie)

It is evident from the quotation above that the student was able to use Google Translate in a critical way. She questioned the reliance on Google for a precise translation.

4. Monitoring Cognition

Students employed monitoring strategies to check that their paragraphs were making sense:

Well, I know there were some texts where I was in doubt about the meaning of it, and so I tried then to look up the words, and find out what it really was meant by it. (1VI Lise)

I read a paragraph (...) and see if that makes any sense (1VI Mette)

This finding is supported by students' log data. For example, one student wrote: "I read a sentence and check if my understanding gives meaning" (1L Mette).

Data also indicated that they reread material for understanding. Students did not only monitor their comprehension, when comprehension broke down they also corrected the problem by reading the material again: One student stated: "Then I read again slowly and looked up the words" (2I Emilie). Another student put it like this: "Interviewer: And try to read again? Participant: Of course, lots of times. Yes, they were difficult, they were difficult texts" (1VI Peter). This finding is supported by students' log data that indicated they read the text several times. From the above quotations, it is evident that the students show the ability to check their understanding of the text.

One student employed the strategy of monitoring to check whether he was right in making a prediction based on the text layout, "But it's not built up here in this way, not completely anyway, somewhere else [in the iBook] it is." (1VI David)

These monitoring strategies show the active participation of the reader to make sense of the text.

5. Evaluating Cognition

This strategy was employed in different ways such as evaluating cognitive strategy use and evaluating performance. For instance, one student stated that the embedded reading strategies in the iBook had made her reflect more on strategy use, "but you think more over them [strategies], you think to use your background knowledge." (2I Laura)

The same student employed the strategy of evaluating cognition for evaluating performance. After reading the text, she reflected upon what she had read, "I was not sure that I understood it [the text] 100%. I looked back again and again". (2I Laura)

Students were asked to write a summary of the texts in their log. This metacognitive strategy – evaluating – was used and valued. As one student expressed in the interview, "Normally, I do not write a summary after reading, but this time I have done and it helped to understand the text". (2I Mathilde)

The same student used the strategy of evaluating cognitive strategy use. She discovered that reading over a long period of time is a better and easier approach to reading than reading in bits.

> But I also think that I discovered that when I was reading the text (...) over a longer period, if I just worked concentrated with the text, it was easier than if when I, for example, 'Well I just can manage to read ten lines'. (1VI Mette)

She also felt that the speech bubbles with reading strategies increased her awareness of the strategies, "Maybe the embedded strategies helped me to be conscious of how I read." (1VI Mette)

The table below shows a summary of metacognitive strategy use.

Metacognitive strategies in the S²R Model	Metacognitive reading strategies identified in the data
Paying Attention to Cognition	Focusing on the passage at hand
Planning for Cognition	Setting a purpose before reading Noting text characteristics before reading.
Obtaining and Using Resources for Cognition	Using technological and print resources Looking for sites that covered both sides of the topic
Monitoring Cognition	Checking understanding while reading Rereading Making predictions
Evaluating Cognition	Evaluating cognitive strategy use Evaluating performance

Table 13. Metacognitive reading strategies identified in the data

5.2.4 Strategic adjustment

An unexpected and interesting result was that cognitive and metacognitive reading strategies were used in dynamic interplay. For example, when a student translated the text with Google Translate (Using Resources for Cognition), she aimed to see if it made sense (Monitoring Cognition). The lack of accuracy of Google Translate triggered the use of another strategy: Monitoring Cognition. During the reading task, the student determined whether the strategy of using an electronic translation tool was working effectively so that she understood what she was reading. As it was not the case, she tried to think of other technical resources that would help her. Then she opted for her digital dictionary on her

stationary computer, "it gives strange meanings, so I stopped [using Google translate]. I used my own dictionary on the computer and tried to translate them." (1VI Meriem).

The strategy of self-monitoring is evident when she decides to change the strategy she has found to be ineffective with a more effective one. The statement above shows that the student reflected on the effectiveness of the online reference materials, in this case Google Translate. It illustrates how strategies interplay and how learners use different strategies in a particular task-phase. It also shows how important is to use an appropriate strategy for accomplishing the reading task.

When another student, tried to activate background knowledge (Activating Knowledge), she checked the new information she read from the text with what she already knew (Evaluating). The following example illustrates how the reliance on background knowledge coincides with the use of another strategy (Evaluating Knowledge):

> One has of course (...) what you think you know, and I do not think, I do not think I'm specially aware of, but you have it, at the moment you read, then you find out that it is not. (1VI Mette)

The student had activated information about the topic *Mexicans and technology*. She tried to make sense of the text based on what she thought she knew about the topic. Since what she knew was that the use of technology in Mexico is not so widespread, her background knowledge was challenged by reading the new information. Then, she contrasted this new information – the text that Mexicans have an advanced use of technology – with the one she had before. It is another example of how one strategy triggers the use of another: Evaluating Knowledge. It is evident from the above quotation that the student learnt from her reading: she links what she knew before reading the text with the new information and realises there is a gap. In other terms, she modifies her schema about the use of technology in Mexico since she has new information she had not previously

considered. Her schema about the use of technology in Mexico changes to accommodate this new information.

These examples show the dynamic interplay between strategies. Strategy use can be characterised as complex and dynamic.

5.3 Findings for Research Question 2

Question 2 in this study asked which functions in the iPad tablets facilitate the use of FL reading strategies and thereby support reading comprehension. Reports from the interviews and logs reveal that students used the following functions to assist comprehension: the embedded reading strategies, the built-in search feature of the iBooks' mobile application (it gives three options: search on Wikipedia, search on the web or search throughout the book), the note function, the glossary, highlighting and underlining. In this section, the features of the iPad will be related to the particular reading strategies revealed by students in the interviews and logs (see Table 14).

5.3.1 Embedded reading strategies

The embedded reading strategies were developed with the iBooks Author application (shapes function) as described in chapter 4. A number of students used the embedding reading strategies to help them understand the texts. Some students felt that the reading strategies embedded in the iBook increased their attention to reading strategies. One student stated, "It makes you to focus … you understand better" (2I Laura)

The above quotation demonstrates that the bubbles with reading strategies reminded the student to focus (each bubble had a particular reading activity for certain challenging paragraphs) and, as a result, assisted her to comprehend the text.

One student stated, "It might have helped to be conscious of how I read." (1VI Mette). Another student expressed, "Yes, well, it helped me to reflect on the text and say 'what is (...) the content here?'" (1VI Peter)

One of the speech bubbles suggested to combine two strategies: highlighting and looking for the theme and the rheme in the paragraph. One student stated:

> and I used highlighting a lot, that is to say, that thing of theme and rheme. (...) you could highlight the text, you could highlight for example the theme and then underline the rheme and in this way, you could say, this is that what you focus on. (1VI Lise)

The data collected from the student's log corroborated this finding. In the following quotation, she gives an example of how she employ both strategies: "I have highlighted the most important words [information] as "employment status is difficult" (theme) and underlined (rheme) education (null or academic)". (1L Lise)

The way the data were collected allowed me to see the development of the use of reading strategies. It is interesting that the strategy of highlighting and underlining the theme and the rheme respectively was introduced in the last text (number 3) but this student used this strategy in text number 2. It is evident that she had read the text several times (confirmed with the data) and she applied this new strategy to other texts.

The feature "Shapes" in iBooks Author made students reflect on reading strategies.
Raising awareness of reading strategies is paramount for reading comprehension as will be discussed in the next chapter.

However, one student was unsure of how to read the text:

> I was a little unsure about, you know, for example, when you open a newspaper, and there is an article, so there is always a headline, and then there is a small headline, where there is such

an introduction to what you need read, and then comes the article. But it's not built up in this way here, not completely anyway, other places [in the text] it is, so I was a little unsure, whether I was just reading the blue [speech bubbles], I thought, maybe it's them [the speech bubbles] I should read first before I move on to the text. (1VI David)

The above quotation is an example of how the embedded strategies might interfere with the student's own choice of reading strategies. The student approaches the text relying on the strategy of planning: he previews the digital text first by noting its characteristics like text structure (title, headings, and subheadings) but he is confused by the bubbles which he has not encountered before and therefore he is in doubt in which order to approach the text.

Another interesting result was revealed by the design of this study, which allowed me to observe the students' performance on the reading tasks at different points (one reading task per week for 3 weeks): It was possible to see the development of reading strategies. Three students did not read the embedded strategies. Data collected by logs and interviews indicated that they read the three texts in the same way, that is, relying mostly on one strategy: using online dictionaries. Conversely, for one student the embedded reading strategies caused her to read texts in a different way: "…. each time you got more strategies" (2I Laura). She pointed out that she read the three texts differently in the sense that she incorporated the strategies learnt from the previous text into her reading.

5.3.2 The built-in search feature of the iBooks mobile application

Students identified advantages using the built-in search feature of the iBooks mobile application. They could search any word or phrase using the Internet. When asked what she did when she encountered an unknown word, one student answered, "I look up the word, I used search function." (2I Laura). Another student stated, "you do not necessarily need a dictionary to have by your side, you can tap the word, and then you can go on the Internet and then find out how you say the word." (1VI David)

The affordance of the mobile technology enabled the use of the metacognitive strategy "Identifying and finding technological resources for cognition".

Most of the students wished that iPads had the possibility of having more than one window open simultaneously. When they found information on the Internet, it was difficult to remember it when they went back to the text:

> then you go to Google and then Google translate (…) But there was a lot of back and forth all the time, I think. I missed that you could have kind of two windows open simultaneously. (…) I like to be able to see things. That is to say, … when I looked up on Google, I could be in doubt in which context [the word] was [in the e-book], and then I had to go back [to the e-book] to see what was written before or after [the word], that might help to understand it [the word]. (1VI Mette)

This is an issue since it is important when reading to be able to relate promptly to the context.

It is important to show students the functions that are available and that can help their reading. For example, in my study many students were unaware of the possibility of looking for specific text within the e-book with the built-in search function. I had showed them the feature but not all the possibilities. The search function gives three options: search on Wikipedia, search on the web or search throughout the book. The last one is very useful if you are looking for specific text within the book or for reviewing.

5.3.3 Note function

Some students valued the note function for reviewing learning material. This helped them to study the new words learnt through reading, as one student commented, "I found out that if you go here [table of contents], it's pretty smart

(…) you can get a full list of the words you have looked up, (…) as a kind of reviewing".

An interesting result was that a student went back to the text and reflected on her notes.

5.3.4 Glossary

Both students' logs and interviews showed that students used the glossary entries for supporting reading comprehension. Students could tap on a term and view its definition in an overlay, so they had the definition instantaneously. As one student stated, "it worked really well, that they [glosses] were there when you had to use them, and not at the end of the document." (2L Laura)

The drawback of a glossary is that it may prevent students from practising other important reading strategies. This drawback was confirmed in the same student's log. She reports that "it [the glossary function] has advantages and disadvantages since one can easily forget to think and rely on one's own knowledge." (2L Laura)

5.3.5 Highlighting

Highlighting facilitated an important reading strategy, namely, identifying central information in a text. In the interviews one student stated, "The highlighting function helps you to find the main points and to look back". (2I Laura)

Metacognitive and cognitive strategies	iPads features mentioned
Paying Attention to Cognition	Shapes feature (iBooks Author app) for modelling reading strategies
Obtaining Resources for Cognition	Built-in search feature of the iBook app Glossary function (iBooks Author app)
Evaluating Cognition	Shapes feature (iBooks Author app) for modelling reading strategies
Using the Senses to Understand and Remember	Insert image (iBooks Author app)

Activating Knowledge	Shapes feature (iBooks Author app) for modelling reading strategies
Conceptualising with Details	Note function Highlighting Underlining

Table 14. Metacognitive and cognitive strategies identified in the data and related to the technology features.

In the students' log there was a question about the advantages and disadvantages of reading FL digital texts with the iPad. It yielded two important and unexpected results.

One student commented that she preferred the clarity of e-books to the scanned PDF files she had encountered before, "It is good that the text is not scanned" (2I Mathilde).

Another unexpected result was the relationship between the tangibility of the digital text and reading. Students said that it was an advantage to read on the iPad rather than on a computer because it was as if you could "touch the words, flip the pages, and add notes where you want". (2L Laura)

This result is relevant for the debate of the intangibility of digital texts.

5.4 Chapter summary: Findings

This chapter presented evidence that students were actively processing the ideas in the text while reading FL digital texts with iPads. The findings from different instruments, semi-structured interviews, students' logs and researcher's log, were used to triangulate the data. In order to better answer the research question, the data analysis was presented in two ways: a) by cases; and b) by research question.

The first section of this chapter presented the data analysis of the 12 cases. All 12 cases demonstrated some use of deep processing strategies – cognitive and

metacognitive strategies in the S²R Model – when reading the Spanish texts on the iPads. Regarding the use of functions in the tablets to help understanding, most cases employed the built-in search feature when they encountered an unknown word. Some cases employed useful functions such as note taking, highlighting, underlining, glossary. The interesting point in the comparison between cases is that being acquainted with the OSX system did not result in participants making more sophisticated use of the electronic features of the iPad to support comprehension. In fact, Cases 1 and 7 who were PC users were the ones that found advanced ways of supporting digital reading processes, such as highlighting the theme and underlining the rheme (what is said about the theme) with the assistance of electronic features.

The second section of this chapter presented the cognitive and metacognitive reading strategies that were identified in the study by applying Oxford's (2011) model as a theoretical lens. It also analysed how the different functions in the iPad create affordances that support reading strategy use. Results show that some functions in the iPads afforded students the opportunity to engage in higher thinking skills.

To summarise, the e-book, with features embedded to scaffold student's use of reading processes while reading digital texts, and the features of the iPad assisted students in using a range of reading strategies for reading comprehension.

6 DISCUSSION

The purpose of this qualitative study was twofold: it sought 1) to identify the reading strategies used by students as they read a foreign language on tablet computers, and 2) to examine which functions in the tablet computers supported reading comprehension processes. The decisions and choices made in developing the digital texts to be read on iPads were based on solid research of the reading process, learning strategies and digital reading (see CHAPTER 2). Thus, the e-book was created with embedded features which were designed to scaffold the student's use of foreign language (FL) reading processes while reading digital texts (see CHAPTER 4). The findings (see CHAPTER 5) suggest that the participants employed a combination of reading strategies: cognitive and metacognitive. The evidence also suggested that the iBook with embedded strategies and the different features of the iPad assisted students to use a range of reading strategies for reading comprehension.

Digital reading processes are more complex than previously suggested (Baron, 2013; Wolf, 2010). This chapter presents a thematic discussion that synthesises the most important research findings from this study. It analyses them in relation to the bodies of literature discussed in CHAPTER 2 and the conceptual framework derived from them. It also aims at explaining how the findings extend scientific knowledge.

The overarching research question guiding this study is:

How can mobile technology mediate FL reading strategies?

It has been addressed in this study using these two research questions:

1. To what extent do learners of Spanish employ cognitive and metacognitive reading strategies when reading with tablet computers?

2. Which functions of tablet computers facilitate the use of FL reading strategies?

6.1 Research Question 1: Cognitive and metacognitive FL reading strategies associated with Spanish reading comprehension using tablet computers

6.1.1 Cognitive Reading Strategies

The first important finding from this study is that students employed cognitive strategies, as defined by Oxford (2011) (see CHAPTER 2). They engaged in macro activities, such as activating background knowledge, and micro activities, such as inferring the meaning of a word.

Similar to research in printed text comprehension (Pressley and Afflerbach, 1995), the findings suggest that a number of students activated background knowledge before reading the digital texts. This finding is consistent with Park et al.'s (2014) research with L2 online reading.

This strategy, which is well documented in research on traditional reading (R.C. Anderson and Pearson, 1984), remains important in digital reading (Coiro & Dobler, 2007) since prior knowledge of the topic plays a central role in text comprehension (Urquhart & Weir, 1998). For foreign language learners, technology can assist in activating background knowledge since it is more difficult to get background information when reading outside the classroom (Mayer, 1997).

Three reading theories discussed in chapter 2 explain well the behaviour of Activating Knowledge seen in this study: 1) The Construction-Integration Model (Kintsch, 1998); 2) Schema Theory (Anderson et al., 1985); and 3) the Interactive Model (Rumelhart, 1980), all emphasise the central role of background knowledge in the reading process.

The use of existing knowledge reflects the process of text comprehension included in the Construction-Integration Model, namely the situational model: the reader builds a mental model of the situation represented by the text. This model of the situation is influenced by the text and the reader's background knowledge. The process of deeply understanding the text occurs within this process of updating the situational model (Kintsch, 1998).

The connection with Schema theory (Anderson et al., 1985) is also clear: the reader interprets the text using background knowledge. In some cases, activating background knowledge led to predictions about text content. For example, David, (Case 2), reported a strategy use that included using the title of the text to make predictions before he began to read. He predicted that the information of the text would be about the youth in Mexico and technology. In this way, he used what he supposed might be the content to make connections to the text. Making predictions activates students' schemata and it helps them make connections between new information and what they already know (their background knowledge) (Nuttall, 2005).

However, in Mette's case (Case 1) her existing schema for the topic was not accurate: what she knew about Mexicans and technology was not congruent with the information in the text. Her expectations about the text content were not met; the reason for this was that the information in the text was not consistent with the activated schema. Nevertheless, she learned from her reading: she linked what she knew before reading the text with the new information and identified the difference.

Consistent with Rumelhart's (1977) notion of schemata, this can be seen as being able to adapt to new information. Her schema about the use of technology by young Mexicans changed rapidly as she accommodated the new knowledge.

The use of the strategy Conceptualising with Details resulted in participants locating important information. This strategy reflects the microprocesses and macroprocesses of text comprehension described by Kintsch (1998). When the reader establishes a macrostructure for the text it assists comprehension (Urquhart & Weir, 1998).

The strategy of Going Beyond the Immediate Data was reflected in different ways: inferring and predicting. Students found different ways of inferring unknown words, including comparing languages, word morphemes, and context. In contrast with studies that have found that second language learners resort to their first language when reading online (Chun, 2011; Grabe, 2009) the findings suggested that a number of students used the knowledge of another language to infer word meaning. The reason might be that the participants of this study had learnt at least two foreign languages at school. Thus, their awareness about learning a foreign language was enhanced (Cenoz & Jessner, 2000).

Findings indicate that the participants used linguistic clues to help them understand the meaning of what they were reading. Using information outside the immediate word to support comprehension is an effective strategy. Often, the alternative is to use a dictionary; while students find out the meaning of a word, their memory will delete the information they have already understood. Thus, some authors (Nuttall, 2005) recommend inferring instead of using the dictionary.

6.1.2 Metacognitive Reading Strategies

The second important finding from this study is that students utilised metacognitive strategies, as defined by Oxford (2011) (see CHAPTER 2). All students demonstrated some reflection while reading digital texts.

The process of self-regulation found in the study has a clear connection with the S²R Model and Metacognitive Theory. This process was reflected in the combined use of metacognitive strategies such as planning, monitoring and evaluating. This metacognitive processing shows in turn that participants were active in the process of constructing meaning from the text.

As findings from the participants indicated, the strategy of planning for cognition was employed in two ways: setting a purpose for reading and noting text characteristics before reading. For example, Peter and Lise (Cases 6 & 7) set a purpose for reading before they began the actual reading: they decided to skim the text to understand the key ideas. Awareness of reading purposes is a characteristic of good readers; by using their knowledge of purpose they can direct their efforts in a more effective way (Pressley & Afflerbach, 1995). The way they skimmed the digital text resembled more the approach to skimming a print text than the one defined by Kol and Schcolnik (2000) for digital texts: "reading the hyperlinked outline provided, clicking the outline to access specific sections of the text, quickly reading and highlighting those sections, and scrolling to read the highlighted sections to get the main ideas" (p.70). One reason might be that participants are transferring print strategies to the digital environment as suggested by Afflerbach and Cho (2010). Another possible explanation is that they were not aware of the affordance in the iBooks application: the table of contents. This theme will be discussed in section 5.2.1.

Understanding of the structure of the text can support reading comprehension (Urquhart & Weir, 1998). Strategic readers plan how to approach the reading task depending on the material (Pressley & Afflerbach, 1995). This strategy also applies to digital online environments, where students' knowledge of printed informational texts may provide a structure that supports comprehension (Coiro & Dobler, 2007). In this study, David (Case 2) reported that he tried to read the first digital text as a newspaper. Consistent with the Construction-Integration Model (Kintsch, 1998), which states that the schema is brought by the reader according to his/her reading goals, David used the headings and subheadings of the text to decide how and what he would read. He tried to figure out the structure of the information presented. Employing non-linear elements in a text such as

titles, diagrams, layout etc. can make the process of reading easier (Nuttall, 2005). This was not the case for David. He realised that the structure was different and became confused since the structure of the text he was activating, a newspaper article, did not coincide with the structure of digital text 1. One explanation for David's confusion, consistent with the Construction-Integration Model, is that he did not activate the appropriate text structure. This example also illustrates Bundsgaard's (2008) point about the importance of reading purpose for coping with digital texts, since it allows the reader to choose different ways of reading and navigating in the digital text (Bundsgaard, 2008). Another explanation is that, following Mayer's (2009) cognitive theory of multimedia learning, the bubbles (see figure 12) in the text might have imposed extraneous cognitive load. This issue will be discussed in section 5.2.2.

Students employed this metacognitive strategy when they did not know the meaning of a word. They took advantage of a wide range of resources to understand the text in the foreign language. The electronic resources most mentioned were the online tools Google Translate and Wikipedia.

The question of whether to use a dictionary or not when FL learners encounter an unfamiliar word in a text is complex. On the one hand, research has shown that in order to achieve a full understanding of a text, the reader needs to know a 94 percent of the words in the text (Laufer, 1989). On the other hand, the use of dictionary can decrease reading speed and interrupts thinking (Nuttall, 2005). Moreover, relying too heavily on the use of a dictionary will impede the use of other helpful strategies such as inferring (Auerbach & Paxton, 1997). Besides, as discussed in CHAPTER 2, reading is more than understanding individual words. Decoding is only one part of the whole reading process (Urquhart & Weir, 1998). In order to understand a text, more complex cognitive processes are needed such as locating main ideas, organising information, inferring meaning of unfamiliar words, drawing inferences (reading between the lines) (Pastor Cesteros, 2004). Reading is an interactive process and students need to learn to be strategic readers (Harvey & Goudvis, 2007).

In this study, students looked up the meaning of unknown words in the dictionary developed for the study (glossary). The result poses questions as to whether to follow Nuttall's (2005) advice of discouraging students from consulting the dictionary. With technology, it is possible to access the meaning of a new word faster than with a print dictionary. In this study, the glosses were accessed by tapping a term and viewing its definition in an overlay, so students had the definition instantaneously. Thus, Nuttall's argument of being interrupted while reading or decreasing reading speed might not apply for digital reading.

However, when students tried to find the meaning of an unknown word on the Internet, they reported that it was tedious to go back and forth between two windows (the digital text and the Internet). Furthermore, Mette (Case 1) reported that she forgot the context where the word was due to the fact that the iPad did not allow *true* multitasking. In this case, when there is no possibility of looking at both windows at the same time, Nuttall's argument holds: it not only took time to look up the word but, what was worse, it interfered with the use of context to understand meaning.

Nevertheless, this last issue can be addressed by an effective use of the technology, as it will be discussed in section 5.2.1.

Students' ability to realise that they do not understand is paramount to reading comprehension (Nuttall, 2005). From the metacognitive theory perspective, reading is an active process where the reader constructs meaning from the text. This view of reading finds support in the participants' approach to making sense of the text. The active participation of students was demonstrated by their ability to check their understanding of the text. They checked that their paragraphs made sense and they reread material for understanding.

As findings indicated, students employed the strategy of Evaluating Cognition in different ways. They evaluated cognitive strategy use and evaluated performance. Research in printed text comprehension has shown that increasing students' awareness of reading strategies assists them in improving their reading comprehension (Mokhtari & Sheorey, 2002). I observed this phenomenon in my

data. For some students (Laura, Lise and Mette – Cases 8, 7 & 1) the embedded reading strategies in the iBook prompted them to reflect about their strategy use. This awareness of reading strategies distinguishes the skilled from the unskilled readers (Pressley & Afflerbach, 1995).

Studying for small periods of time (spacing) is more effective than studying for a concentrated period of time (Karpicke & Roediger III, 2010). The findings of the pilot suggested that mobile devices enable spacing, which is an effective study technique. However, in the main study one student reported that she felt that when she read the text for a long period it was easier to understand it than when reading the text in small parts. A possible explanation for the contradictory result can be found in the Construction-Integration (CI) model (Kintsch, 1998): reading processes work both at a micro and macro level. The global context of the text is important in the integration phase of the model. Thus, when reading just a few lines, the integration phase is impeded.

6.1.3 Strategy adjustment

Because of the way the analysis was conducted, it was possible to see also how the students used strategies in combination. The analysis revealed that cognitive and metacognitive strategy use was highly complex (see figures 21 and 22). When participants found the translation of a word on the Internet inappropriate for the context, they would look up the word using a different tool. For example, Meriem (Case 3) reported that when she met a new word she would look it up in Google Translate (Obtaining Resources for Cognition), then she self-monitored to see if her translation made sense, and then tried another technological tool – a reliable electronic dictionary installed on her laptop. The lack of accuracy of Google Translate triggered the use of other strategies: Monitoring Cognition and Evaluating Cognition. During the reading task, the student determined whether the strategy of using an electronic translation tool was working effectively (Evaluating Cognition) so that she understood what she was reading. As it was not the case (Monitoring Cognition), she tried to think of other technical resources that would be reliable and would help her (Obtaining Resources for Cognition). Then she opted for the digital dictionary on her stationary computer. The strategy

of Evaluating Cognition is evident when she decides to change the strategy she has found ineffective with a more effective one.

This example illustrates how a learner adjusted her use of strategies. Oxford (2011) argues that this type of strategic adjustment is precisely self-regulation. The strategy of Evaluating Cognition, which normally occurs in Task-phase 3, strategic reflection, appears in Meriem's case in Task-phase 2 (see Figure 20) because the electronic resource did not work. This finding illustrates how some strategies can occur in multiple phases, which is consistent with task-phases in the S²R Model.
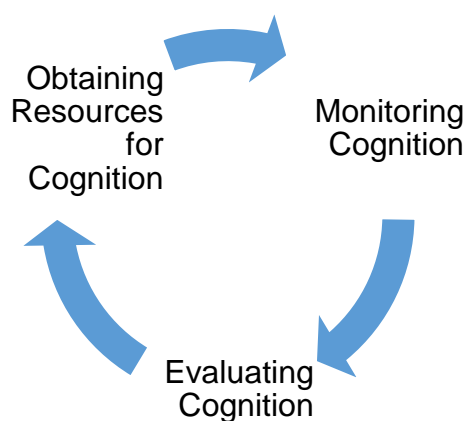
Figure 20. Strategies occurring in Task-phase 2

The findings in this thesis related to the dynamic and non-linear self-regulating process are consistent, both with previous literature regarding conventional print texts (Lee & Wolf, 1997; Phakiti (2006), and with digital texts (Coiro & Dobler, 2007).
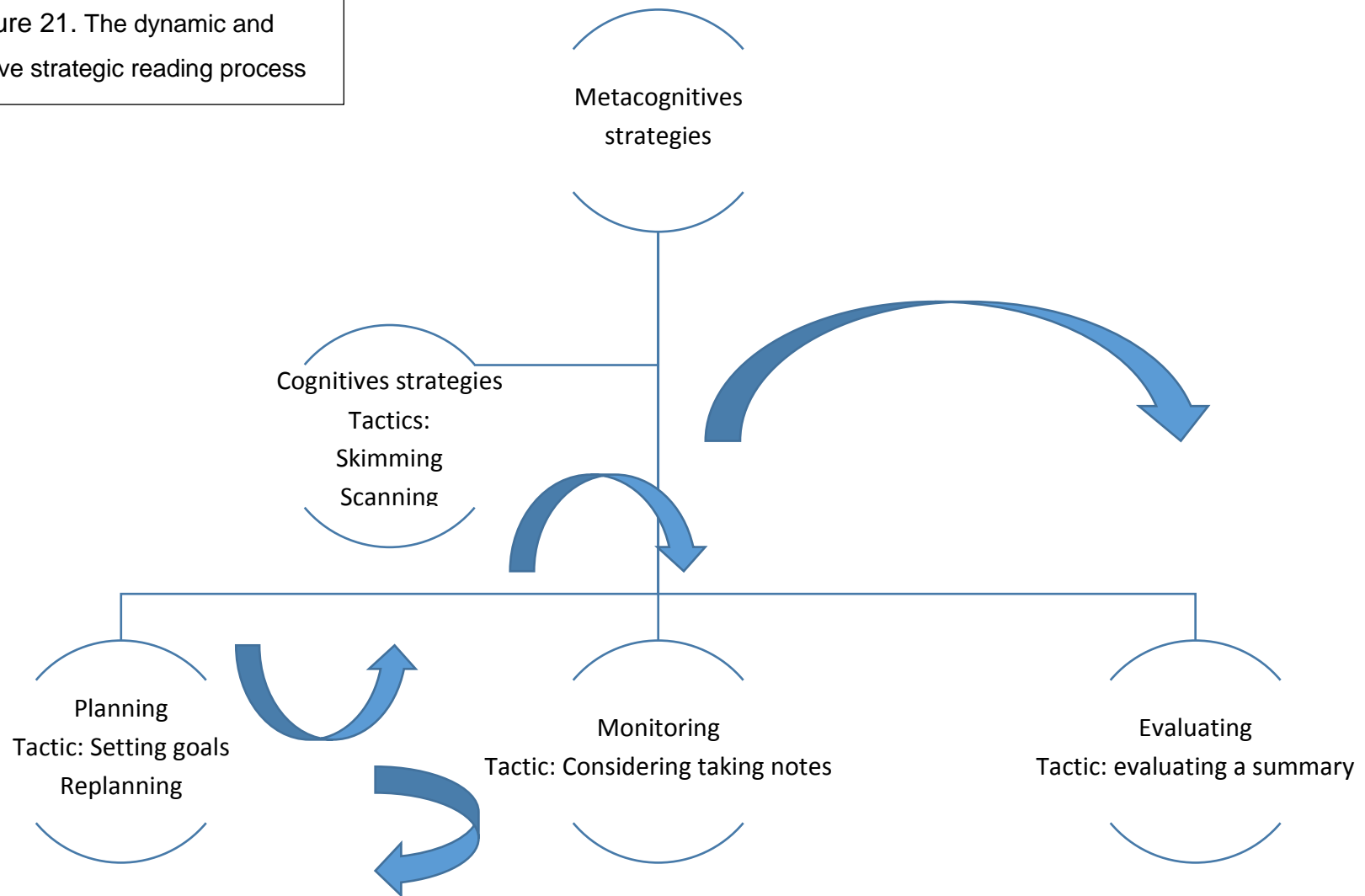
Lee & Wolf (1997) emphasise the dynamic interplay of strategies and argue that "strategy use can be characterised as diverse, simultaneous, and flexible" (Lee & Wolf, 1997, p.38). In his qualitative data analysis, Phakiti (2006) also found that cognitive and metacognitive strategy use was highly complex. Research on traditional reading shows that planning, monitoring and evaluating may "operate simultaneously and in rapid sequences" (Afflerbach & Cho, 2010, p. 202).

Participants in Coiro & Dobler's (2007) study employed this self-regulated reading process when searching and locating information on the Internet. Park et al. (2014) found that the decision-making process for trying to understand vocabulary in the readings also followed this recursive model in the context of reading a foreign language on the Internet. This shows how important it is to use an appropriate strategy for accomplishing the reading task.

As with research on traditional reading, I found that skilled readers applied their knowledge of strategies to a specific text and task and modified their strategies to adapt to the situation. This confirms research on reading strategies that emphasises the importance of using the appropriate strategy for any specific task (N.J. Anderson, 1991). This result is important since using this cycle for comprehending texts results in increases in learning and self-efficacy (Zimmerman, Bonner & Kovach,1996).

The dynamic, non-linear process is also consistent with foreign language learning viewed from a complexity theory perspective (Larsen-Freeman & Cameron, 2008). From this perspective, language learning is viewed as a dynamic and non-linear process. That is, the language acquisition process does not proceed from step 1 to step 2. Another contribution of this thesis to the body of knowledge on reading is the link to complexity theory and viewing strategic reading as a dynamic, non-linear process (see Figure 21).

Figure 21. The dynamic and recursive strategic reading process

Metacognitives strategies

Cognitives strategies
Tactics:
Skimming
Scanning

Planning
Tactic: Setting goals
Replanning

Monitoring
Tactic: Considering taking notes

Evaluating
Tactic: evaluating a summary

6.2 Research Question 2: Functions of the tablets which facilitate strategy use for FL reading comprehension

Within the S²R model of language learning it is assumed that learning strategies are learnt through mediation (Oxford, 2011). That is, knowledge construction is assisted through dialogue between the teacher (or an individual who is more knowledgeable) and the learner. In the classroom, the teacher can mediate students' strategic learning, but when learning takes place outside the classroom strategies are learnt for mediation from cultural tools: language, books, technology (Oxford, 2011, p.27). However, the S²R model does not explain in which way technology can mediate student's strategy learning. In this thesis, I have argued for the use of technology as a tool for mediating strategy learning and I have shown how this can be achieved.

An important contribution to knowledge of this thesis is the finding that electronic books read on iPads may serve as metacognitive tools provided that they have the appropriate scaffolds. It adds another layer to the complex debates on this issue. There has been much debate in recent years as to whether students might be less inclined to reflect when they read digital texts (Baron 2013, Wolf 2010). This study has shown that students may engage higher thinking skills when reading digitally, with the appropriate electronic scaffolds, such as embedded reading strategies, and features of the applications available on tablets, such as annotating, highlighting.

The findings indicate that some features of the technology supported FL strategy use. In the next section, I will discuss the features in the iBooks application that assisted students in understanding the digital texts.

6.2.1 Features in the iBooks application

Reports from the semi-structured interviews and logs revealed that the following features of the iBooks application supported FL reading strategies: the table of contents, the built-in search feature, highlighting, underlining, note-taking, shapes and glossary.

Table of contents

Reading strategies might change in the digital environment, for example, skimming in the Internet (Afflerbach & Cho, 2010). New ways of skimming and scanning have been defined. Kol & Scholnik (2000) provide a new definition for skimming and for scanning to match screen reading, since the hyperlinked table of contents allows a global view of the text. The hyperlinked table of contents in digital texts supports the strategy of skimming (Kol & Schcolnik, 2000). The strategy of skimming with traditional print texts has normally been defined as looking over the whole text to get the main idea (Oxford, 1990). Applying the strategy of skimming on digital texts is "reading the hyperlinked outline provided, clicking the outline to access specific sections of the text, quickly reading and highlighting those sections, and scrolling to read the highlighted sections to get the main ideas" (Kol & Schcolnik, 2000, p.70).

In this study, previewing could be done as defined by Kol and Schcolnik (2000) since the iBooks application has the feature "table of contents". However, I found that some students did not perceive this affordance. In order to access the table of contents, you have to tap on an e-book on the iPad, and then a number of icons will appear at the top of the page. On the left is the Table of Contents icon, a green box (see Figure 22). If the reader wants to have an overview or to skip to a different part of the e-book, he or she can tap on the table of contents button in the upper left and tap on the chapter he or she wants to read.

Figure 22. Table of contents

David (Case 2) asked in the interview if there was a feature where you could see the outline of the e-book. He had not found this feature on the iBooks app. It is crucial to train students when they are introduced to a new technology (Levy, 2009), such as when reading books on the iPad or other e-reader (H.R Schugar et al. 2013). In this study, I gave instructions on the use of the iPad and iBooks app as described in chapter 4. However, I assumed that they would be sufficiently competent in using the technology that they would immediately find all the possibilities that the features offer. The concept of "digital natives" no longer holds (Lanclos, 2016) and we cannot assume that students, based on their knowledge about technology, are prepared to read e-books effectively (H.R. Schugar et al., 2013). I found this phenomenon in my data. Even though the iBook had a table of contents, some students did not use it. Consistent with H.R. Schugar et al. (2013), this can be seen as lack of instruction. In this study, I introduced the students to the basic functions of the iPad, but not to all the functions. I assumed that some were obvious, for example, the top menu, where the table of contents and search could be accessed.

Mathilde (Case 10) commented that she preferred the clarity of e-books to the PDF scanned files she had encountered before. The importance of this result has been discussed in connection with research on reading digital texts conducted with PDF files (Mangen et al., 2013). The point here is that reading something in a PDF format is different since you do not have a table of contents or other

features to support comprehension. The table of contents in digital texts supports the strategy of skimming (Kol & Schcolnik, 2000). Results from the current study show that the affordances available with fully digital texts (generated from an electronic source as opposed to scanned documents) can help the FL reader to better understand the text by supporting reading strategies. In addition, it provides a better reading experience than PDF scanned files. This finding has implications for FL reading practice with digital texts.

Search

A built-in search feature of the iBooks mobile application supported the strategy of Obtaining Resources for Cognition. When reading an e-book with the iBooks app, the reader can tap and hold on any word or phrase, whereby a pop-up bar appears with options to search for that selection (see green box in Figure 23) on the Internet and in Wikipedia. Students used this built-in search feature to search for words and phrases using the Internet.
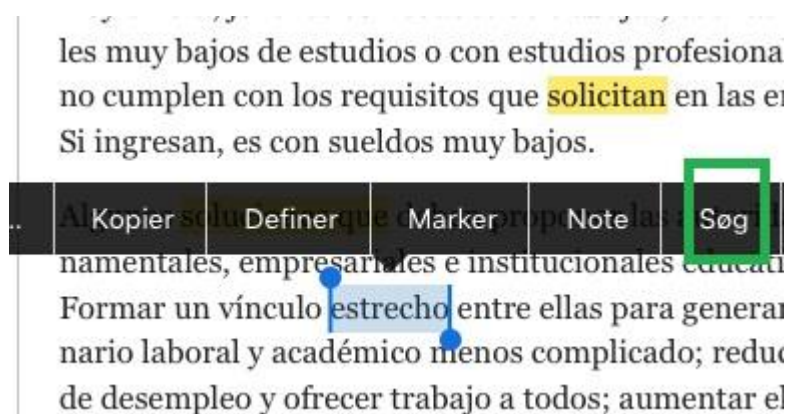

Figure 23. iBooks search function

Both the interview data and the students' log data indicate that students frequently used online dictionaries and electronic translation tools such as Google Translate to determine the meaning of words not understood. These results are partly consistent with two quantitative studies (Huang et al. 2009; Shen, 2014) on the use of online reading strategies.

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In the Huang et al. (2009) study, students used dictionaries and highlighting much more than other strategies. Shen (2014) also found that young English as Foreign Language (EFL) learners relied most on support (SUP) strategies. Due to the research design, the present study also found <u>how</u> students used these tools. It thus provides additional information about the process of looking up the meaning of unknown words. For example, some students did not only look up the word or sentence; they checked if the translation by Google translate was reliable. In this way, they also employed the metacognitive strategies of Monitoring Cognition and Evaluating Knowledge. This type of data cannot be observed with the instruments that Huang et al. (2009) and Shen (2014) utilised (a questionnaire). The reason why students relied heavily on electronic translators might be that they had immediate feedback and it saved them time in decoding (Huang et al, 2009, p.20); the drawback is that decoding is needed to understand a text (Urquhart & Weir, 1998).

The fact that the iPad cannot show multiple windows was an impediment to learning new words. A student explained that she could not remember the context where the word was by when she had looked up the word in Google. In this case, the technology did not support comprehension. This example illustrates how looking up words may interfere with the student's short-term memory. The information about the new word she had just looked up is lost due to the fact that the iPad did not really multitask at the time of the study. This phenomenon observed in the data is in accordance with H.R. Schugar et al.'s (2013) recommendations for the use of this strategy. They argue that looking up words may interrupt the reading process so it is crucial not to rely only on this strategy. Their suggestion is to employ inferring, since in the digital environment the strategy of inferring can be accomplished using other clues such as sound and animations.

Screen scanning is defined as "quickly searching for specific pieces of information by using the Find feature of the word processor" (Kol & Schcolnik, 2000, p.70). This study did not use a word processor but the search function in the iBooks application allowed scanning of the text in the same way as in Kol & Schcolnik's study.

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The findings of this study show that students were unaware of the possibility of looking for specific text <u>within the iBook</u> with the search function. The search function gives three options: search on Wikipedia, search on the web or search throughout the book. The last one is very useful if you are looking for specific text within the book. At the time of the study, this option was accessed by tapping on the magnifying glass icon in the upper right of the screen and typing in a search term (see the green box in Figure 24). This result is consistent with G. Conole's argument (personal communication, June 26, 2013) that the user might not realise the affordances are available.
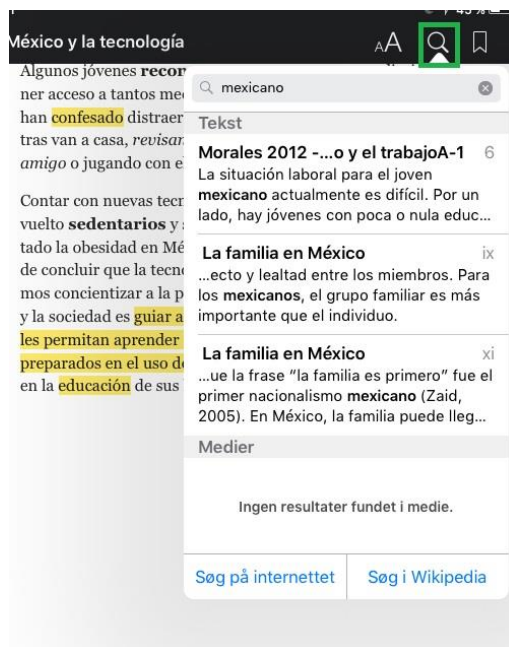

Figure 24. Search throughout the book

Highlighting feature in iBooks application

Highlighting facilitated an important reading strategy, namely, identifying central information in a text (Conceptualising Broadly in the S²R model). This finding contradicts J.T. Schugar et al.'s (2011) results. They found that students did not report using highlighting with digital texts whereas they reported utilising highlighting when reading traditional print texts'. A possible explanation for the

contradictory result is the use of a different mobile device in the J.T. Schugar et al. (2011) study: participants reported the Nook (eReader) as being "clunky".

Note-taking

This feature facilitated the strategy of Paying Attention to Cognition and Conceptualising Broadly. Students categorised the information; they distinguished between the main ideas and the details. There was evidence that this feature supported learning and reviewing of new words. Kukulska-Hulme (2013) argues that this feature (not present in earlier mobile devices) can serve as a "lasting memory aid and a valuable tangible link between different learning environments" (Kukulska-Hulme 2013, p. 3702). Again this result is inconsistent with the J.T. Schugar et al, (2011) results; in their study, participants did not use the annotating feature *w*hich supports reading strategies.

Shapes

Another contribution to knowledge relates to methodology in the field of reading strategies. In this thesis, I used a different empirical tradition. The research paradigm used in this study, complexity theory, was reflected in the design of the study, which allowed me to observe the <u>development of reading strategies</u> at different points in time. In this way, evidence was found of awareness-raising of reading strategies due to the scaffolds embedded using the feature "Shapes". The strategy of highlighting and underlining theme and rheme were introduced in the last of the three texts (number 3) they had to read for the study. However, Lise (Case 7) applied it to text number 2. Although she knew about the strategy, when reminded in text 3 she went back to text 2 in order to apply it. This implies that she found this strategy useful. Learning strategies and applying them to new contexts is crucial in strategy learning (A.D. Cohen, 2011).

Lise's changing patterns of strategy use can be explained by complexity theory. Her reading process is congruent with the iterative, recursive process that characterises complexity theory (Doll, 2012), with its focus on change. This example shows how changing conditions altered Lise's approach to reading the digital texts (see Figure 25).
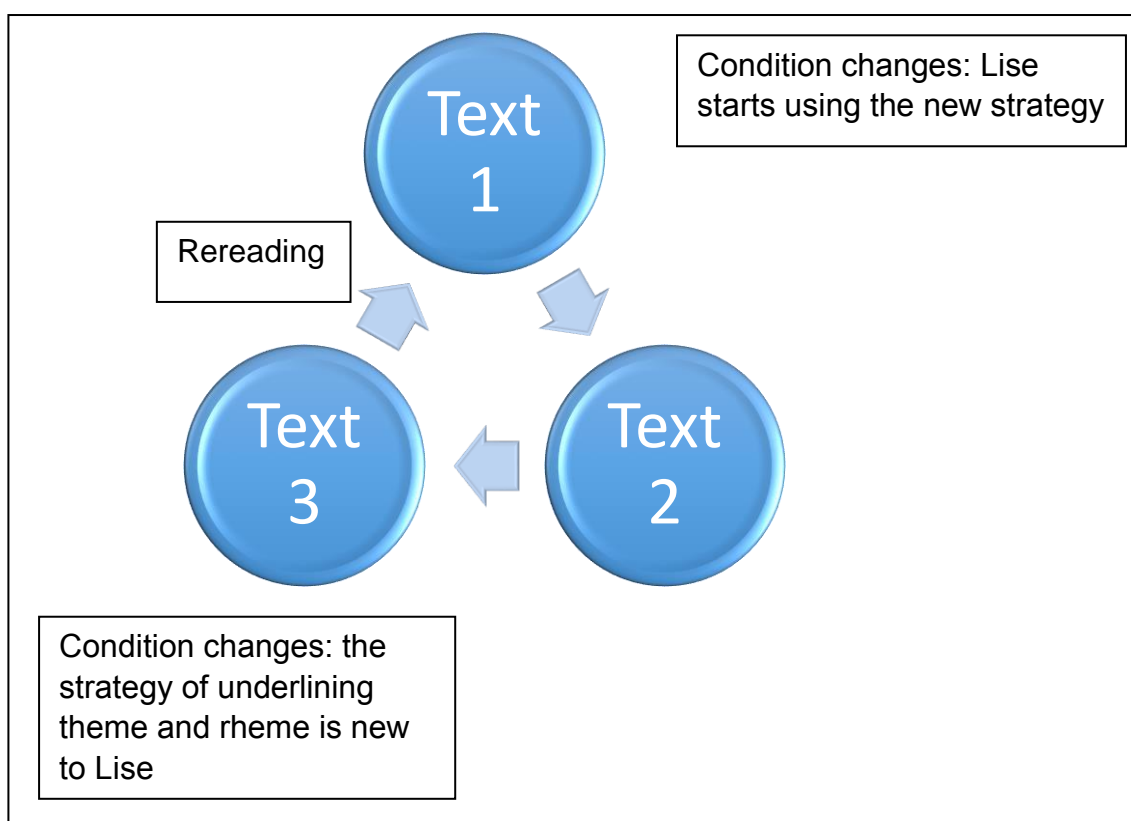
Figure 25. Changing patterns of reading strategy use

There has been much critique in foreign language reading research about the way FL reading is implemented in the classroom. The focus is often on FL learning and not so much on the reading process (Nuttall, 2005; Pastor Cesteros, 2004). In this study, the "Shapes" feature in iBooks made possible the intrinsic promotion of strategies to support both the FL reading process and the strategy-learning process. Lise valued the possibility of both learning about the FL reading process and learning a foreign language. She learnt about the FL reading process with the bubbles that provided an explicit explanation in Danish of why that particular strategy should be used. She learnt the foreign language with the instruction of the bubbles that guided the reader in how to apply the strategy in that particular context. This finding is congruent with Oxford's (1990) original division of strategies for managing L2 learning and strategies for the learning process.

Awareness of reading strategies is paramount for reading comprehension. There seems to be a positive relationship between the use of metacognitive awareness of reading strategies and foreign language reading ability (Sheorey & Mokhtari, 2001). Awareness of reading strategies is also useful in that FL readers can enlarge their inventory of strategies and reflect on the reading process and in this way increase comprehension (Auerbach & Paxton, 1997). Use of the feature "Shapes" in iBooks Author made students reflect on their reading strategies. This phenomenon, observed in the data, parallels Hauck's (2005) findings, who noted that metacognitive development was fostered by awareness-raising activities in online distance language learners.

However, as mentioned in section 5.1.2, the feature caused confusion to one student. David (Case 2) had not encountered this feature before and therefore he was in doubt as to in which order to approach the text. There are several explanations for this. First, Mayer and Moreno (2003) argue that it is important to reduce extraneous information when designing e-learning materials. Moreover, research on e-book design (H.R. Schugar et al.,2013) recommends giving instructions to students when e-reading and explaining to students how the use of a strategy is different across the two formats (print and digital). In this case, the student did not receive instructions and he applied the strategy as he used to do in the print format without embedded strategies. Therefore, the new format created confusion.

Another possible explanation is that the student here might have automatised the reading strategy of planning, and it is interfering with the conscious strategy in the bubble. Oxford (2011) claims that a strategy is conscious; if it is not conscious it is not a strategy. Macaro (2006) proposes the use of reflection for moving the strategy from procedural knowledge (automatic) to declarative knowledge (conscious).

The glossary function

There are different views on the use of glosses for reading comprehension. On one hand, we know that in order to reach a good comprehension of a text it is necessary to understand 94 % of the words in the text (Prichard & O'Hara, 2008).

Studies on dictionary use show that looking up words in the dictionary and finding the definition increases attention to the word and therefore more opportunities for retaining the word. On the other hand, in a study on learners' dictionary overuse Peters (2007) argues that learners did not retain the new words in long-term memory because they looked up too many words.

Some students felt that the glossary entries were very efficient for supporting reading comprehension. Students could tap a term and view its definition in an overlay, so they had the definition instantaneously. The glossary function also supported the strategy of Obtaining Resources for Cognition. My findings in this thesis are inconsistent with Chun (2006). The results of her study, that examined "look-up behaviour with glosses" for vocabulary and reading comprehension, showed that students did not take advantage of this feature. She concludes that the fact that dictionary definitions are available is not sufficient for students to use them. She explains that it might not be easy to access them or students do not know how to use them. The reasons for the inconsistency with my study may be that the glossary feature of the iBooks Author application was more advanced than the feature in Chun's study. The glossary created for this study with iBooks Author application was easily accessible. The definition could be viewed in an overlay simply by tapping a term. Students found this highly intuitive and were able to use this feature very effectively. These findings are in accordance with Levy's (2009) recommendations that annotations should be intuitive.

The use of a glossary is also an advantage when the text is too difficult (Jacobs, 1994). However, Jacobs (1994) warns learners to use glossaries with caution since it is possible they can prevent students from practising other reading strategies, such as guessing from the context, rereading and paraphrasing, among others strategies that they would need with texts that do not have a

glossary. This drawback was confirmed by Laura (Case 8). She reported that the disadvantage of using the glossary function was that it could prevent her from relying on her own knowledge. Along the same lines, H.R. Schugar et al. (2013) recommend not to overuse this feature when reading digital texts because it may interrupt the reading process and prevent the reader from using other strategies.

However, when FL learners are at a beginner level, translation to the native language is necessary in order to understand the text (Chamot,1988). Research on strategies conducted with traditional print texts has shown that to look up words interferes with short-term memory – while you are looking up the meaning of a word, your memory loses information you have already understood from the text. Researchers in this field (e.g. Nuttall, 2005) recommended not using glossaries very often. With technology, this problem might not apply, since access to the definition is instantaneous; tapping on a word displays a definition immediately. More studies with this function should be conducted in order to determine the effect of looking up words with electronic tools, such as glossaries, on memory.

The e-book with embedded strategies and the different features of the iPad assisted students to use a range of cognitive and metacognitive reading strategies for reading comprehension. This result is inconsistent with J.T. Schugar et al. (2011) and H.R. Schugar et al.'s (2013) results. They found that students did not use the reading strategies they utilised when reading print texts. The participants in their study did not use features such as annotating and highlighting which support the reading strategies discussed in this section.

The findings of this study extend knowledge of theory, the S²R model, by identifying the way in which technology can mediate student's strategy learning. It has identified the features in the technology that support the use of reading strategies. The iPad features and the supported strategies are summarised in Table 15.

Features in the iBooks application	Supported reading strategies
Table of contents	Conceptualising Broadly (Skimming)
Built-in search feature	Obtaining Resources for Cognition Monitoring Cognition Evaluating Cognition Conceptualising with Details (Scanning)
Highlighting	Conceptualising with Details (Locating central information in the text)
Underlining	Conceptualising with Details (Locating central information in the text)
Note-taking	Paying Attention to Cognition Conceptualising Broadly
Shapes	Awareness of reading strategies
Glossary	Obtaining Resources for Cognition

Table 15. Features in the iBooks and iBooks author application
and the supported strategies.

6.3 Unexpected results

Tangibility

An unexpected result was the relationship between the tangibility of the digital text and reading. Findings showed that it was an advantage to read on an iPad rather than on a computer without a touch screen because it was as if you could "touch the words" (Student log, 2L Laura).

This finding is inconsistent with Hillensund (2010) who supports Mangen et al.'s (2013) arguments about the relationship between the intangibility of digital texts and lack of immersive reflective reading. He argues that text materiality and ways of reading are interrelated. Again, the inconsistency of this result may be due to the material utilised, a non-digital native text, and the hardware, a stationary computer. The touch screen of the iPad 2 makes digital texts tangible. This finding

is relevant for the debate of whether digital texts are detrimental for reading comprehension as has been discussed in the previous section.

6.4 Using the potentials of the mobile technology to engage in high-level thinking processes

The findings of the study shed light on important theoretical and empirical issues and make a contribution towards a resolution of the controversies surrounding the field of digital reading. Contrary to research that postulate that students might be less inclined to reflect when they read digital texts (Baron 2013, Wolf 2010), my data suggest that all participants, at least in this study, engage in higher-level thinking processes when reading digital texts.

Findings from the study are in line with the conceptual framework developed in Chapter 2. In the cognitive dimension of the Strategic Self-Regulation (S²R) Model (Section 2.3.1), two types of strategies support this dimension: metacognitive and cognitive strategies. The participants used most cognitive and metacognitive strategies in the model. Additionally, some students developed in their use of reading strategies while using an iPad.

These results are consistent with previous findings from other studies that have been conducted with print material (Pressley & Afflerbach, 1995), using computer technology (Lange et al. 1999), and web pages (Afflerbach & Cho, 2010). However, the findings in this thesis are inconsistent with the literature on digital reading which focuses on the differences between reading print and digital texts (Mangen et al., 2013). The reasons for this inconsistency appear to be the material utilised. Mangen et al. (2013) used PDF scanned files; thus, they did not take advantage of the full potential of digital media and platforms. In contrast, electronic books have additional features that may support comprehension.

The debate about the effect the medium may have on learning is examined in the meta-analysis conducted by Russell (2010). He concludes that technology per se does not improve learning outcomes; the way the technology is used has an

effect on learning. I agree with Russell in that the difference is not in the medium. In my case, with the iPads, the summaries written by the students showed a good understanding of the digital text. In order to comprehend the digital text, they used cognitive and metacognitive reading strategies. My data suggest that by adapting the content to the technology and taking advantage of the technology's affordances, this medium allows and encourages students to engage in higher-level thinking processes. Along the same lines, van den Broek, Kendeou, and White (2009) argue that the features of multimedia texts do not support comprehension per se. They recommend that the features must be used appropriately if they are to support the students' learning and application of reading strategies.

Interestingly, these results are contrary to Wolf's (2010) argument that students might be less inclined to analyse and reflect when they read digital texts. The argument being put forward here is similar to Terry Anderson's argument (personal communication, April 17, 2015). Anderson argues that if one compares the two media without looking at the affordances, one will see learning with a technology as having no added value. However, by taking advantage of the affordances of the technology, such as the annotations, the search features, the possibility to collaborate, etc., these features can make the difference between reading a book in print or in a digital text. It is crucial to look at the potential of the technology from the perspective of their affordances.

One of the contributions to knowledge from the present research is the finding that participants reflected while reading, which is in contrast to one side of the debate about whether students might be less inclined to reflect when they read digital texts (Baron 2013, Wolf 2010) and whether digital reading affects comprehension (Mangen et al. 2013). In the present study, participants used the deep processing strategies described in the S²R Model, which "facilitate understanding, increase meaningful mental associations, and are the most useful strategies for long-term retention of information" (Oxford, 2011, pp.29-30).

There are three possible explanations for these findings. The first possible explanation is related to the iBook's features used in this study. The embedded

scaffolds that model strategies in the electronic book (see Figure 11) might have helped students to engage in thinking while reading. In this way, students could extract meaning from the text (as revealed from the students' summaries).

The second explanation relates to students' transference of reading strategies. They might have transferred strategies from traditional reading contexts to the digital environment. These findings are consistent with Afflerbach & Cho's (2010) analysis of Internet reading. They conclude that context matters and that many strategies are transferred from traditional contexts to Internet contexts. However, my findings partially contradict J.T Schugar et al (2011) findings. They found that the students who employed reading strategies when reading from paper did not transfer them when they read on an e-reader. This discrepancy could be attributed to the usability of the e-book reader employed in their study (a Nook e-reader) and its "clunky interface" (p.183).

The third explanation lies in the participants' age. Even though there is no extensive research on the relationship between age and the use of learning strategies, Macaro (2001) upholds that adults and older adolescents' use of strategies may be more flexible than young learners. Moreover, adult learners are more capable of utilising metacognitive strategies (planning, monitoring, evaluating).

6.4 Chapter summary: Discussion

This chapter presented an analysis of the research findings. The types of cognitive and metacognitive reading strategies used by students were discussed against the literature, as well as the electronic features that support the use of reading strategies.

The application of the S²R Model (Oxford, 2011) was proposed, by explaining in which way mobile technology can mediate students' strategy learning and by identifying the features in the mobile technology that model self-regulation in the digital reading process. Unexpected results were also presented and discussed.

7 Conclusion

This study set out to investigate how mobile technology can mediate foreign language (FL) reading strategies. Specifically, the extent to which FL students employ reading strategies when reading digital material on a tablet computer and how FL students engage with a digital text in order to achieve comprehension. The study also sought to determine which features of the tablet support reading comprehension and enable awareness of FL reading strategies.

This chapter examines this study's main contributions to knowledge and describes the conclusions. It also discusses limitations and proposes directions for future research studies.

7.1. Empirical findings

The overarching research question guiding this study is:

> *How can mobile technology mediate FL reading strategies?*

It has been addressed in this study using these two research questions:

> *1. To what extent do learners of Spanish employ cognitive and metacognitive reading strategies when reading with tablet computers?*
>
> *2. Which functions of tablet computers facilitate the use of FL reading strategies?*

The main findings were presented and summarised in chapter 5. This section will synthesise the main findings to answer the thesis' two research questions. My research study was a multiple case study. I found in answer to research question 1 that students employed metacognitive and cognitive strategies to assist them with FL comprehension when reading foreign language texts on the iPads. There was evidence of metacognitive strategies such as planning, monitoring and

evaluating for cognition. Of special interest was the metacognitive awareness of reading strategies. Research (Sheorey & Mokthari, 2002) has found a correlation between students' awareness of reading strategies and reading comprehension. The ability to reflect and think whilst reading is crucial for comprehension. Students also used cognitive strategies such as Conceptualising Broadly, Activating Background knowledge and Going Beyond the Immediate Data. The data collection in three different time periods allowed me to see the development of strategy use over time. Some students read texts using strategies learnt from a previous text. The more these students read texts with embedded strategies, the more aware they became of these strategies. Consequently, evidence of students using higher-level thinking skills was a major finding of this study.

2) Reading strategies were enhanced through the use of various features of the iBooks application such as the note function, the built-in search feature and the shapes feature in the iBook Authors application. This last feature, where the reading strategies were embedded, promoted students' awareness of reading strategies.

The patterns emerging from my data suggest that students employed a wide range of reading strategies to construct meaning from the digital texts. It also suggests that some features of the applications supported the use of reading strategies. Thus, my findings contribute initial insights to the limited body of research in this area, which will be discussed in the next section.

7.1.1 Researcher's log

Maxwell (2013) argues that a valuable technique in research is writing memos of the field work as well as the researcher's ideas or reflections. The advantages of writing memos are that they enable the researcher to reflect on the research process and enhance validity (Harding, 2013). Memos can be all pieces of writing that a researcher does related to her research and that facilitate reflection (Maxwell, 2013). Consequently, the researcher's log in this thesis included:

- researcher's reflections on the field work

- researcher's notes after the interviews
- researcher's brief comments on interview transcripts
- account of the choices for analysing data
- diagrams with main theories and key concepts on reading

In this thesis, the researcher's log served as a tool for thinking and developing ideas. All the pieces of information above contributed in making connections across the data and the literature. The researcher's log was not just a record but also a tool for understanding the study. For example, it helped me to be consistent with the research paradigm and the four models of reading in the whole process. It also served in the decisions about analysis and how to present the results. The value of the researcher's log was that it facilitated reflection. In this way, I was able to look critically at what I was doing. Appendix 7 shows an example of a reflection after an interview. It struck me how well prepared the participant was for the interview. This fact shows a serious answering behavior of the participant, which increases validity to the research.

7.2 Contributions

This study provided different insights into the process of FL readers' meaning construction using tablets. It also identified affordances in the applications available on tablets that promote the use of reading strategies. It is the first time that this phenomenon has been investigated within the context of foreign language reading with tablets in Europe. Even though this advance adds a new perspective of the phenomenon to the body of knowledge, it would not itself be called a contribution. More substantial contributions to knowledge addressed in this section are: 1) applying the S²R Model to mobile technology; 2) interdisciplinarity; 3) addressing controversies in the field of digital reading; 4) proposing guidelines for designing digital textbooks; 5) developing a research instrument for reading strategy research; and 6) applying Complexity Theory to reading strategy research.

1. Applying the S²R Model with mobile technology

This study contributes to existing learning strategy theory in that the Strategic Self-Regulation (S²R) Model does not include <u>how</u> technology can mediate student's strategy learning. My thesis supports and applies the S²R Model by documenting and explaining in which way mobile technology such as iPads can mediate students' strategy learning.

2. Interdisciplinary study: reading, metacognition, learning strategies, foreign language learning and mobile learning

I have brought understanding from the fields of reading, metacognition, learning strategies and foreign language learning into the mobile learning area, particularly iPads, by applying metacognition theory and learning strategy theory in the context of reading electronic books with mobile devices.

Metacognition is well established in the field of reading but it is not as evident in the field of mobile assisted language learning (MALL). In this field, device portability has been identified as having the following advantages: "ready access to relevant help, more flexible use of time and space, continuity of learning in different settings, problem solving" (Kukulska-Hulme, 2013, p.3701). Thus, this study adds a further advantage to MALL: support for self-regulation in reading.

3. Addressing controversies in the field of digital reading

The findings add evidence for how students use the deep processing strategies in the S²R Model when reading digital texts in a foreign language. Thus, they shed light on important theoretical issues and help to resolve a controversy in the field of digital reading. There is much debate as to whether students might be less inclined to reflect when they read digital texts. This thesis suggests that it is not the medium that makes the difference, but <u>how</u> the technology is used. It is important to take advantage of the digital features to improve reading comprehension of digital texts. Digital texts are not good or bad per se; they can promote reflection provided that their features allow interaction between the reader and the text.

These findings contribute to the current literature in various ways. First, we have to be cautious about generalising findings from different forms of digital text, because each form of digital text contains different features to support comprehension. For example, the PDF format does not take full advantage of the digital media. In particular, PDFs of scanned documents do not have an active Table of Contents, and the PDF format does not support embedded reading strategies in the way the iBook does. We need to distinguish in digital reading research between the kinds of digital material used in different studies to be able to draw valid conclusions for practice. Second, the various types of digital texts require the use of different strategies from the reader. Finally, it is important to teach our students a wide repertoire of reading strategies so they can navigate and create meaning from the digital texts they read. Students receive instruction in how to read print texts but it is not the case for digital texts.

4. Proposing guidelines for digital textbook design

This thesis has brought expertise from five different fields to the design of a cognitive-based digital text to assist learners of Spanish as a foreign language in developing better reading strategies. This research adds to the body of knowledge by revealing how the features of digital text can support comprehension.

This study showed how affordances of the mobile technology play a role in the self-regulated reading process. As a result, it provides guidelines for good electronic book designs for learning that are consistent with theories of reading. It suggests that the electronic book can be a metacognitive tool by constructing scaffolds for reading with technology.

The developed digital texts for Spanish courses included three texts in Spanish about youth in Mexico (see Appendix 8), each with embedded reading strategies. Not only are reading strategies presented (guided practice), but also details are shown of why the presented strategy should be used (explicit explanation).

5. Developing a research instrument for reading strategy research

The findings of this thesis also extend knowledge of methods for reading strategy research. The use of visual information allowed me to observe and ask the participants how they used the iPad and to obtain information about participants' reading processes. If they did not verbalise an observable reading strategy, I could see the strategy associated with an observable behaviour in the video. Thus, this method provided a richer source of data.

6. Applying Complexity Theory to reading strategy research

Another contribution of this thesis to the body of knowledge on reading is the link to complexity theory and viewing strategic reading as a dynamic, non-linear process (see figure 1). From a complexity perspective, even though one cannot find the cause of an effect, overall patterns can be found in chaos (Kellert, 1993). Metacognitive processes are not linear; they may occur at the same time when accomplishing a reading task (Anderson, 2002). In the same way, a learner may employ a number of different tactics for a given strategy. The process is different from learner to learner and it may appear as chaotic, but nonetheless a pattern can be found.

These contributions have been shared in more than one format. In the next section, I will substantiate the claim that my study has made a contribution to knowledge by presenting the peer-reviewed publications and the different audiences.

7.3 Dissemination of findings

The direct application of research findings is a core element of the research process (Carey, 2013). In order to determine how my results should be presented I have considered my audience and tailored the presentation. For example, teachers and publishers are more interested in how results apply to their practice; while in an academic conference, delegates are more interested in the details of data collection and analysis. A contribution to the field is even more significant when results are shared with a larger audience (Castle, 2012). In the course of my research process, the dissemination of this thesis has taken various forms:

- being invited as invited speaker at digital reading conferences in Denmark and Norway.
- discussing research findings with colleagues

- presenting a paper at a conference
- publishing a book chapter
- allowing research findings to directly influence teacher practice
- being approached by IGI Global to publish a video
- being approached by a secondary school for providing advice on digital reading to students
- being approached by several secondary schools for providing advice on digital reading to teachers
- widening the audience: a book on digital reading for primary education quotes my findings even though the participants of my study are from secondary education
- integrating findings within future research
- being approached by Dafolo to publish my thesis

Width and depth of impact

The findings of this thesis are already published in the form of a book chapter (Auer, 2015) and a conference paper (Auer, 2014). These publications captured the attention of the Danish press as well. As a result of an interview in Gymnasieskolen, the online magazine from the National Union of Teachers in Denmark, dissemination extended beyond academic publications. In March 2015, I was approached by Cappelen Damm, one of Norway's leading publishers of educational, scientific and academic literature, to give a talk about my project in a conference on digital learning at Oslo Theatre. I have also been requested to present in a conference on digital learning in Denmark (April 2016) based on my results. In the course of these presentations, teachers, educational leaders and publishers have emphasised in their remarks that my presentation was very

useful and that they would apply it to their practice. They also asked for advice on how to do so in their particular context.

I have also used social media to disseminate my research with success: in January 2015, [Dafolo](), a Danish research-based publisher, offered to publish my thesis. They learnt about my research after conducting a search in LinkedIn.

Due to the positive impact of my published book chapter, which has seen high search rates through IGI Global various platforms, the publisher has invited me to create an informational video or lecture based on the content presented in my published work.

I have also been approached by the [Nordic Journal of Digital Literacy]() for peer reviewing manuscripts on digital reading.

Moreover, my research has been quoted in a context other than foreign language learning in secondary education. In a book about digital reading, one of the editors mentions that my results are also interesting for the field of reading comprehension in varied subject-matter in primary school (Carlsen, 2015). The fact that my results can be used for other populations and other subject-matter texts adds a breadth of impact to my research

All these facts reflect high interest in my research, which might be due to the fact that there is little **research-based** information available for teachers and publishers to draw from. Sharing my results has assisted practitioners by increasing knowledge and understanding in this area.

7.4 Conclusions

The main conclusions from this research relate to five areas: 1) Active reading of digital texts; 2) Reading strategies mediated by interaction with mobile technology; 3) Taking advantage of e-tools to improve reading comprehension of the digital texts; 4) Constructing scaffolds for reading with technology, and 5) Technology skills instruction.

Active reading of digital texts

The concept of metacognition applied to reading is important no matter what the medium. Cognitive and metacognitive reading strategies assist meaning processing when reading digital texts on mobile technology. Digital texts require the active involvement of the reader. In order to construct meaning from a digital text, students have to be active readers and engage with the digital text by employing cognitive and metacognitive strategies.

Reading strategies mediated by interaction with mobile technology

According to the S²R Model there are different ways of providing strategy assistance for FL readers with the purpose of increasing self-regulation. The S²R Model mentions, but does not explain, how strategies are learnt with mediation from technology. This study has shown how to improve strategy use with mobile technology, specifically iPads. The e-books created for this study helped students to become more strategic readers.

Strategy instruction can be adapted to tablet computers. It is crucial to train students in reading strategies to promote critical reading with digital texts. Students need strategy assistance and mobile technology, such as iPads, can mediate reading strategies.

Taking advantage of the affordances of the mobile technology to improve reading comprehension of the digital texts

This thesis has shown that it is not the medium but how the technology is used that makes the difference. It adds to the debate on digital reading. Applications available on tablets such as iBooks, iBooks Author, or Book Creator offer possibilities to promote the use of reading strategies and in this way support comprehension. If the digital environment does not provide features to interact with the text, such as highlighting, note-taking, etc. or the usability of the technology is not appropriate, then reading on-screen has no advantages over reading on paper. It is important to use the e-tools effectively in order to understand the text, as this thesis has shown.

Constructing scaffolds for reading with technology

Affordances in the iBooks app promote awareness of cognitive and metacognitive reading strategies in electronic books. It is important to be aware of reading strategies for comprehending texts in a foreign language. Therefore, it is important to design learning materials with scaffolds that encourage strategy use.

Technology skills instruction

Both the iBooks and iBooks Author application have features that support the use of reading strategies. Nevertheless, students do not know how to take full advantage of the mobile technology for reading digital texts. It is crucial to train students in the use the electronic tools on a mobile device so they can read effectively.

As a result of this research on FL reading strategies and mobile technology, I propose the following model of reading processing with mobile technology which addresses individual and external factors and their interaction. Internal factors such as age, language aptitude and previous knowledge on technology have an impact on the self-regulated process.

Regarding the external factors, in the mobile context, (see Figure 26) the role of the student is more active. The prompts in the book encourage students to apply the reading strategies on their own. The role of the student is to select the strategies without prompting from the teacher, whereas in the classroom they are asked to learn those presented by the teacher. Thus, in the mobile environment students have more responsibility for their own reading development.
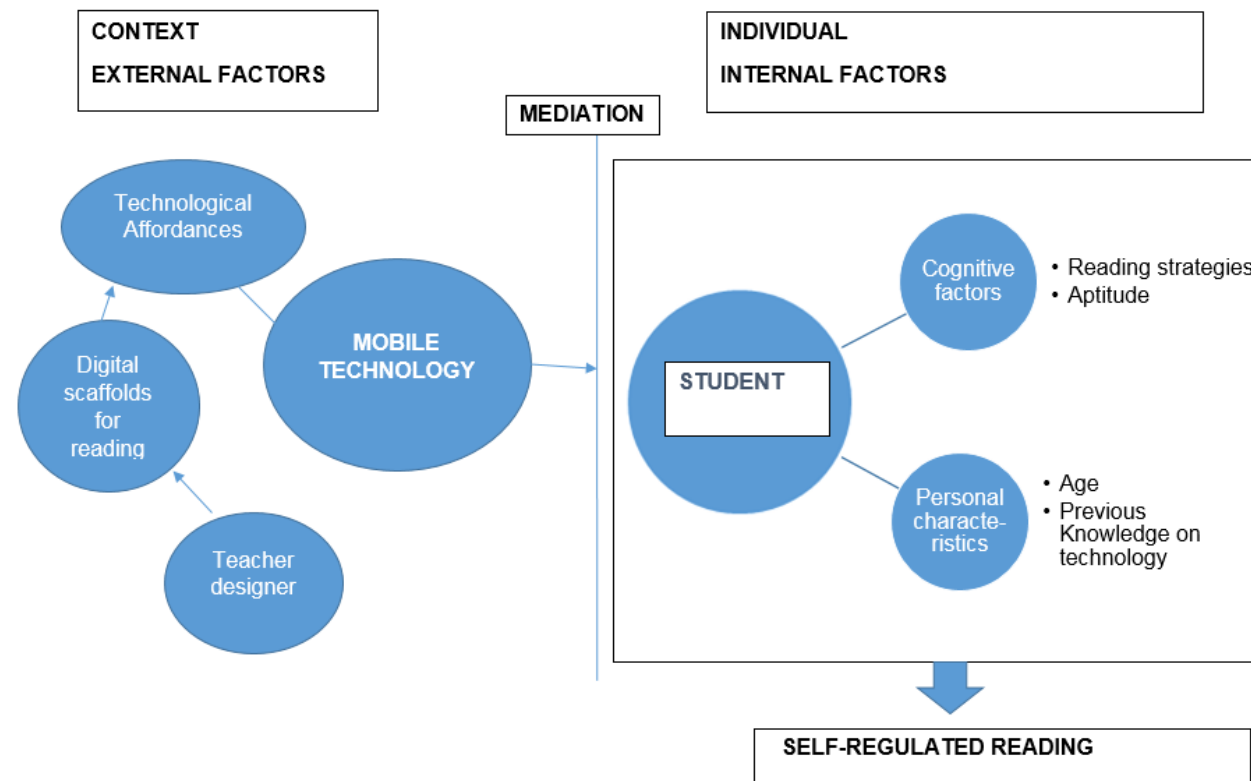
Figure 26. The theoretical model of this thesis

7.5 Implications for practice

The findings of this thesis have implications for teaching, course design and policy-making.

Teachers and publishers already benefit from these findings since they have requested my expertise for conferences and workshops for teachers and it has helped them to better understand reading behaviour onscreen. In the course of these presentations teachers, educational leaders and publishers have emphasised in their remarks that my presentation was very useful and that they would apply it to their practice. They also asked for advice on how to do so in their particular context.

7.5.1 Implications for teaching

Schools present many components of complex systems – students, peers, school, families, society and policy making, among others – which are interrelated (Cohen, 2011). in addition, the learning space is becoming even more complex with the entrance of mobile technology in and outside the classroom. Thus, the question of how to integrate mobile learning into classroom practice represents a challenge to teachers (Kukulska-Hume & Jones, 2011).
Kukulska-Hulme and Jones (2011) claim that mobile learning makes it possible for teachers to design for learning outside the classroom. They go on by saying that teachers will need advice and examples of how to work on innovative design.

From a complexity theory perspective, the phenomena under investigation is open to new revisions. A model within this paradigm is "an ongoing process" (Doll, 2012. p. 32). In looking at the implications of this research for practice in the light of complexity theory, it is argued that instead of producing a model or method that prescribes practice, research should offer guidelines so that teachers can select and apply the most appropriate knowledge to the complexities they encounter in this new technology-infused learning environment. Studies like this one can offer practitioners an account that will help them to understand patterns of digital reading behaviour in a foreign language. While not providing a precise

way of teaching or using FL reading strategies with mobile technology, it can raise awareness of the wide variety of FL reading strategies which are appropriate to a particular learning context so that teachers can expand their pedagogical decisions as to how to use mobile technology for reading in a foreign language.

Teachers should raise students' awareness on the type of strategies they employ for reading a traditional text and digital texts. They need to distinguish which strategies are similar and which are different in the two formats. For example, there are better ways to skim a digital book than those available with print text.

Students need to be trained in both reading strategies and technological skills. They need to learn to consider the type of text – print or digital – the type of digital environment – internet, e-book, PDF, etc. – and choose the appropriate reading strategies and e-tools for the particular context. Teachers cannot assume that students will master the technological skills, required for reading effectively, without support.

Courses on educational technology for teachers should include an awareness of the role of the teacher as designer (see figure 27). With the mobile technology, the teacher becomes a designer. The teacher has to design the scaffolds in the digital text so that their students can construct meaning from the texts. The teacher will have to remove gradually the scaffolds so that the students become independent readers. The instructions in the scaffolds about the use of reading strategies will provide students with knowledge and practice of reading strategies and in this way they will be able to self-regulate their reading. Teachers should be trained in designing learning material to scaffold reading in a way that they provide students with opportunities to learn and apply reading strategies.

7.5.2 Implications for learning design

This research also makes an indirect contribution to the design of e-learning courses, since reading digital texts for learning a subject matter effectively is crucial in e-learning courses.

The study brought together expertise from five fields in the design of the e-book to help learners of Spanish as a foreign language develop better reading strategies. The e-book incorporated reading strategies to help users understand the texts.

The practical side of this research project was the development of e-texts for Spanish courses. The developed e-material included three texts in Spanish about youth in Mexico with embedded reading strategies. Not only are reading strategies presented (guided practice), but also details are shown of why the presented strategy should be used (explicit explanation). Following the recommendations of strategy instruction, my study did not "pass on a list of strategies to be imitated" (McDonough, 1995, p.87). Instead, the strategies were embedded in a particular context and they had to be utilised in that particular context.

Looking at the results of this thesis, it can be argued that it is important to embed reading strategies within the FL digital material to support metacognitive processes when reading with iPads. In this thesis, I showed what material developers can do to develop metacognitive awareness for FL digital reading. Since research has found that reading strategies are one of the main factors for facilitating students' reading comprehension, it can be concluded that schools / e-material developers need to embed reading strategies.

Research from reading and technology shows that the use of appropriate reading strategies for comprehending information in e-material is crucial. Especially for foreign language learners, technology can assist with their using metacognitive strategies, such as activating background knowledge, since it is more difficult to get background information when reading outside the classroom (Mayer, 1997). In addition, developing metacognitive awareness strengthens learning skills (Anderson 2005, p 767).

In choosing or developing quality e-texts/books and deciding how best to use tablets to support FL reading comprehension, teachers should consider the following based on this study:

- Show students applications and functions in iPads that support FL reading comprehension.
- Embed reading strategies in the digital material to support cognitive and metacognitive processing by using an application for creating e-books.
- Engage students in cognitive and metacognitive processes through using the embedded reading strategies and explain why they should do so.

We should bear in mind that one result showed that the embedded strategies might confuse about how to approach the text. The implication for practice is therefore to follow Mayer's principles for designing digital learning material since extraneous information might hinder learning.

Most textbooks on reading strategy instruction recommend following the three phases: planning, monitoring and evaluating. They do not encourage students to be flexible in their reading process. This study has shown that these phases do not need to follow a linear order. Students can choose a different order if that is better for them – adapting their reading is at the heart of the self-regulation process.

7.5.3 Implications for policy

When I created a proposal for the research, I was not addressing a policy problem. This is an issue I found last year when I delivered my talk in Oslo. It was corroborated by teachers there. The actual secondary education policy recommends using technology in the classroom but they do not show how. The findings of this thesis show that the actual policy should include how and when it is appropriate to introduce technology and digital reading skills. The curriculum not only has to introduce digital reading at a low pace and to integrate reading strategies (Wolf, 2014) but it also has to show a progression.

The integration of digital reading into the curriculum should also include suitable teaching methods. As mentioned above the role of the teacher is to facilitate the

process of reading whereas the student engages in active reading and takes responsibility for his or her own learning.

7.6 Future research

The research conducted here addresses previous gaps in the literature. However, as a result of my study, further research is indicated in other areas: 1) the use of audio and video in digital texts; 2) the effect of awareness of FL reading strategies on reading performance; 3) glossaries ; 4) larger samples; 5) removing scaffolds for digital reading; and, 6) online courses.

Research on students' reading of digital material has focused on comparing reading on screen versus paper and on stationary computers (e.g. Mangen et al. 2013), not laptops, tablets or mobile phones. This study used iPads and text. However, due to time limitations, the use of video and audio as reading strategies were not examined. The use of video and audio can provide opportunities for investigating the effects of video and audio in reading comprehension. It would be fruitful to research the effect of using these tools for enhancing reading comprehension within a multimodal learning perspective (Mayer, 2001).

My study presents students' use of FL reading strategies using iPads, but future research could focus more on these reading strategies, which play such an important role in FL reading comprehension. The effect of awareness of FL reading strategies on reading performance could also be investigated.
The empirical findings of this thesis also show that research on glossaries needs to be revisited. With technology, the issue of looking up a word and its effect on short-term memory might no longer apply, since access to the definition is instantaneous. More studies with this function should be conducted in order to determine the effect of looking up words with electronic tools such as glossaries on short-term memory. Current advice, to limit the looking-up of words in order to focus better on the text, may be out-of-date.

Research is also needed into how a research-based reading intervention might be implemented with tablets. In my research, the e-book that was created contained various reading strategies, thus modelling reading processes that are required for good comprehension. Students used a wide range of reading strategies, taking advantage of the digital media. Nevertheless, there is not enough research evidence to guide teachers and material developers in the process of using the full potential of the iBooks Author app or other similar applications to create learning materials for the purpose of promoting the use of reading strategies.

Further research is needed to examine the full potential of FL digital materials and mobile technology applications, drawing on foreign language acquisition research, to help learners learn effective reading strategies. It would be fruitful to research the effects of this technology on students' awareness of FL reading strategies using other methodologies and a larger study.

There is a need for more research that can be used to guide policy-makers to include digital reading skills in the curriculum.

It would be interesting to study how best to remove scaffolds in digital reading. There is much discussion about scaffolding, but not about removing scaffolds. The scaffolds should be removed as the student progress (Diaz-Rico & Weed, 2002).

Finally, future studies should aim to encourage students to reflect while they are reading FL digital texts so that they become self-directed language learners. Further research needs to ask how technology is used outside the classroom for reading digital texts, especially with online courses.

7.7 Limitations

Difficulties always arise during research; as Drew puts it "It is impossible to anticipate all of the contingencies that will occur during data collection" (Drew, 1976, p.18).

The selection of the cases: The recruitment of participants was restricted by three parameters: time, level of Spanish and trust for lending the iPad. Participants in the adult education centre were students with family and work. Therefore, their time was an issue. The positive side was that being adults they felt committed to the study and delivered all the tasks meticulously. Recruiting participants at the second school was more challenging because I did not know the students. In addition, it was a busy time of year for these students.

Instruments: At the time of the study, I did not know of an application that would capture students' reading behaviour on the iPad. An application that would have recorded student's actions would have supported the interview data and filled the gap between what the participants said and what they actually did. Nevertheless, in this study the video recording during the interview captured some of these actions.

Learning materials: At the time of the study, the technology, iBooks author app, had its limitations in supporting reading processes and I, as a doctoral researcher, had a time limit. Today, if I were to develop a digital text I would include these functions to promote further strategic reading:

- Video
- Collaborative tools

The use of video is useful for activating background knowledge, which is very important in the classroom, but even more important outside the classroom (Mayer, 1997). To read a text without activating background knowledge has little value because comprehension is the process of relating new information to information already stored in memory.

The iBooks application does not allow students to collaborate with peers or with the teacher. This would be a useful feature, as would a discussion forum. Digital social reading is based on constructivist theories of learning where social interaction is essential for creating meaning and knowledge. So here again,

technology opens up new opportunities. Students could discuss, review the book, ask questions to each other and, with their classmates, try to arrive at an interpretation.

As to the structure of the digital text, in my study the strategies were part of the text. With the appropriate technology, I would have followed Mayer's (2009) principles for designing digital learning material and reduce extraneous information. In future, I would embed the reading strategies so they could be accessed in an overlay. In this way, the risk of confusing the reader with the text structure would be minimised.

In this project, I did not gradually remove the scaffolds due to time constraints associated with doctoral research. Removing scaffolds would have required the development of a whole digital book, which cannot be completed during a PhD project, nor is it the purpose of this doctoral research.

In spite of these limitations, the choice of cases, data collection and analysis worked together and provided strength to my results. Moreover, while the purpose of case study is not to generalise to a broader population, my study has already been cited in a book for digital reading skills for primary education (Carlsen & Hansen, 2015). One of the editors of the book argues that even though the student population of my research was drawn from secondary institutions, my study is applicable and useful to other contexts, namely primary education.

7.8 Technology use in Denmark

In 2010, at the time of the pilot, the only e-book reader in the Danish market was Bebook One eReader, a firm from Holland. The popular readers, Sony Reader and Amazon Kindle had not enter the Danish market. Comparing with other European countries as the France, Spain and the UK, the electronic books in Denmark came late to the market. Danish editors were very unwilling to edit digital books.

iPad 2, the mobile device used in this study, came to the Danish market in March 2011. In 2012, at the time of the study, it was very unusual to see a student with an iPad. Only in those schools where research projects on tablets were being conducting, was it possible to observe students with iPads. Some of these projects started with no pedagogy or theoretical insights.

As students at that time did not bring their own tablet to the classroom, I have to start the main study by giving on loan the iPads. From 2012 on, there has been a number of initiatives by the Danish Ministry of Education in order to promote digital learning. At the same time the prices of tablets computers have decreased and more and more students now come to the educational institutions with their own device.

The fact that the mobile devices in this study were not own by the students may have affected the results. The participants of this study knew that they had to deliver the devices after the research and they may have not use it in the same way as if it were their own. Besides, they were not acquainted with the iPad and they did not know how to use it. This fact may have caused additional cognitive load. If the mobile devices had been their own, it would have been probable to observe more use of strategies and more use of features of the mobile technology, since the student would have been acquainted to it. A reduction in cognitive load may have an impact in the use of reading strategies. Thus, the findings in this thesis cannot be generalized, but the fact that the participants of this study reflected while reading and some felt that their awareness of reading strategies was raised by the prompts with reading strategies in the mobile technology makes a widely applicable and a long-lasting contribution to the body of knowledge digital reading.

7.9 Chapter summary: Conclusion

This thesis illustrated several cognitive and metacognitive strategies that students use for FL learning when they use iPads, despite it often being argued that students might be less inclined to reflect when reading digital materials. Thus,

this thesis contributes to existing learning strategy theories, particularly on reading strategy research and to digital reading research.

These strategies were enhanced through the incorporation of FL reading strategies in the iBooks Author application. Technology can help the learner by modelling reading strategies, as the teacher does in the classroom. The technology in this study supported reading comprehension processes and showed that it is not enough to transfer strategies from paper format to digital format. The digital text does not have to imitate the older formats of the print texts, but may develop something new. It is important to use digital features to model metacognitive thought to make digital reading more effective.

APPENDICES

Appendix 1: Pre-interview questionnaire online (1st round) (PILOT STUDY)

The questions below were translated into Danish and imported to the online survey software SurveyMonkey

Section A: Knowledge of the language

1. **How long have you been studying Spanish?**
   - Less than 8 months
   - Between 9 and 12 months
   - Between 1 and 2 years
   - More than 2 years. Please describe ………

Section B: Handheld devices and mobility

2. **Do you use handheld devices such as mobile phones, PDAs, laptops, netbooks?**
   - Yes, every day
   - Yes, at least once in a week
   - Yes, less than once in a week
   - No, I never use handheld devices

3. **Had you ever used an e-book reader before you received one on loan this time?**
   - Yes
   - No

4. **Where do you use the e-book reader?**
   - Public transport
   - At home
   - At work

- Open areas such as a park, a beach, a wood
- Other place of using the ebook reader – please describe ……..

5. **To what extent is it necessary for you to have many books on one device?**

   Please indicate the extent to which you feel it is necessary, by rating from 1 (not necessary) to 5 (very necessary)

   1   2   3   4   5

6. **To what extent is it important for you not to travel to the library when you borrow a book?**

   Please indicate the extent to which you feel it is important, by rating from 1 (not important) to 5 (very important)

   1   2   3   4   5

Section C: E-book readers functions

7. **Listed below are the procedures involved in the setup of the e-book reader. Please indicate the extent to which you find these difficult, by rating <u>each</u> procedure from 1 (not difficult) to 5 (very difficult). Please choose a rating for each procedure**.

Preparing the PC, including the installation of the software Adobe Digital Editions that allows the PC to communicate with the e-book reader.	1	2	3	4	5
Preparing the e-book reader – the actual connection with the PC	1	2	3	4	5
Finding and downloading an e-book from the Internet	1	2	3	4	5
Borrowing an e-book from the library	1	2	3	4	5
Transferring an e-book from the PC to the e-book reader	1	2	3	4	5

8. **Listed below are the functions involved in the use of the e-book reader. Please indicate which of these you use and what you think of its value. Please choose an answer for each.**

	Used and valued	Used but of limited value	Not used
Open an e-book			
Turn the page			
Go to the last or first page of a book			
Jump to a page			
Zoom in and out			
Add a bookmark			
Catalogue			
Search for a book			
Delete e-books and documents			
E-book information			
Play music			

9. **How often do you use the e-book reader?**
   - Once a week
   - 2-3 times in a week
   - More than 4 times a week

Section D: E-reading and learning

10. **Have you read e-books before the loan of the e-book reader?**
    - Yes
    - No > go to question 13

11. **From where did you access the e-books before the loan of the e-book reader? Tick any that apply.**

c

- A computer
- A laptop
- A mobile phone
- A PDA
- An e-book reader

12. From where did you download the e-books? Tick any that apply.
- From an e-library
- From an e-bookshop
- From the Internet
- Other source of acquiring e-books – please describe ……

13. **Do you enjoy the reading experience on the e-book reader?**
- Yes
- No

14. Are your eyes tired when reading e-books on an e-book reader?
- Yes
- No

15. Do you use more learning materials than before you received the e-book reader on loan?
- Yes
- No

16. If you download any learning material now, from where do you download it? Tick any that apply.
- From an e-library
- From a e-bookshop
- From the Internet
- Other source of acquiring e-material – please describe ……

17. Do you feel you read faster than on a printed copy?

- Yes
- No

18. **The e-book reader allows you to listen to and read the text at the same time. How often do you listen to and read the text at the same time on the e-book?**
    - Very often
    - Often
    - Rarely
    - Never

19. **Which functions would you wish to have on the e-book reader to help with your understanding of the texts (both oral and written)?**

20. **For what purposes, other than learning Spanish, would you use the e-book reader?**

Appendix 2: Pre-interview questionnaire online (2nd round) (PILOT STUDY)

The questions below were translated into Danish and imported to the online survey software SurveyMonkey

The focus of this 2nd round survey is on the reading and learning process supported through the e-book reader. Therefore, I would like you now to think about your learning and reading process over the past weeks.

Learning technology enabled

1. Has the e-book reader changed the way you learn a foreign language?
   - Yes
   - No

2. If you answered 'Yes' to Question 1, can you briefly explain what has changed?

3. Does reading from an e-book reader affect your concentration?
   - Yes
   - No

4. If you answered 'Yes' to Question 3, can you briefly explain why?

Mobility and learning

5. The e-book reader is a handy device, which is easy to carry around. Does this fact affect your learning?
   - Yes
   - No

6. If you answered 'Yes' to Question 5, can you briefly explain how it affects your learning?

Learning and Interaction

7. Do you use the e-book reader
   - Alone
   - With someone

8. Can you briefly explain your answer to Question 7?

9. Do you share the e-material with others?
   - Yes
   - No

10. If you answered `Yes' to Question 9, can you briefly explain what you shared?

11. Do you use the Discussion Forum "E-book readers" in our learning platform to share tips and tricks about functionalities of the e-book reader and/or advice on obtaining e-material (e-book shops, e-libraires, e-books for free, etc.)
    - Yes
    - No

12. If you answered 'No' to Question 12, can you briefly explain why?

Second language learning

Reading skills

13. How do you look up words you do not know when reading on an e-book reader?
    - In a dictionary
    - In the vocabulary lists which are at the end of the e-material

- I do not look up words
- Other way of looking up words, please describe ....

14. Listed below are reading strategies that optimise reading. Which of these strategies do you use when reading on the e-book reader? Tick any that apply.
   - I read or listen about the topic that I am going to read before reading the text
   - I check information in the text I am reading in other books or texts on the e-book reader
   - I skim the text to get the general idea before reading the text
   - I know what I wish to learn before reading the text

15. What kind of reading does the e-book reader support best?
   - Reading for pleasure (novels, short stories, etc.)
   - Reading for learning (academic texts such as textbooks, journal articles, etc.)
   - Other, please describe ....

16. Can you briefly justify your answer to Question 15?

Listening skills:

17. How might the listening material pre-loaded on the e-book reader support your language learning in the future?

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Appendix 3: Interview schedule for the semi-structured interviews (PILOT STUDY)

The questions below were translated into Danish

a) Factual questions

b) Learning experience

What factors do you think have help you to succeed in your education? If you knew someone was having difficulty learning, how would you help him or her ? Do you use these strategies in learning a foreign language?

Areas to cover: learning processes, learning strategies

c) Learning outside the classroom

Tell me a little bit about your experience of learning with others; who do you prefer to ask questions of when you do not understand? (teacher, students, family,..)

Areas to cover: interrogating and sharing with others

d) Learning technology enabled

Tell me a little bit about how you learn with technology; does the fact of having a mobile device at hand all the time change your way of learning? Can you describe your experience with the e-book reader?
How can the e-book reader assist your learning process? Where? What kind of problems have you encountered with the technology?

Areas to cover: affinity for handheld electronic devices, optimising reading time, remote access (lack of), portability.

e) Foreign language learning

Could you tell me about your experience of learning foreign languages?

If you knew someone was having difficulty reading in a foreign language, how would you help him or her?

Reading strategies (looking up words, background information, skimming, scanning, etc.) How does the e-book reader support these strategies?

Listening strategies (anticipating topic, key words, visual clues) How can the e-book reader support listening comprehension in a foreign language?

What kind of material did you read or listen to?

In which way have you used the e-book reader for improving your Spanish?

Can you name some advantages of using an e-book reader for learning a foreign language?

Is there anything you feel that supports your foreign language learning that we have not covered?

Areas to cover: language skills (reading, writing, listening, speaking), learning strategies applied to reading and listening skills, mobile assisted language learning

Appendix 4: Participant Consent Form

The text below was translated into Danish

BACKGROUND INFORMATION

Title and researchers. The title of this research is 'Facilitating metacognitive reading strategies in Mobile Assisted Language Learning'. My name is Natalia Auer. I am PhD student from the University of Leicester, School of Education.

Reason for the research. The purpose of this study is to identify the metacognitive reading strategies used by Spanish learners in a digital environment and to examine which technology features in tablets facilitate foreign language reading strategies.

Details of participation. The research involves completion of 2 questionnaires on reading strategies. You will then take part in a video interview comprising questions about your experience reading in a foreign language with tablets. The session should take about 30 minutes. Your responses will be treated confidentially. Your information will be anonymous. The results are published in a form so that individuals cannot be recognized.Please feel free to ask questions now if you have any.

CONSENT STATEMENT

1. I understand that my participation is voluntary and that I may withdraw from the research at any time, without giving any reason. In case of having completed a questionnaire, I can request to be removed from the research at any time and my data will be deleted.

2. I am aware of what my participation will involve.

3. I understand that there are no risks involved in the participation of this study.

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4. All questions that I have about the research have been satisfactorily answered.

I agree to participate.

Participant's signature: _____

Participant's name (please print): _____

Date

Appendix 5: Interview schedule for the semi-structured interviews (MAIN STUDY)

The questions below were translated into Danish

a) Factual questions

b) Learning experience

What factors do you think have helped you to succeed in your education? If you knew someone was having difficulty learning, how would you help him or her ? Do you use these strategies in learning a foreign language?

Areas to cover: learning processes, learning strategies

c) Learning outside the classroom

Tell me a little bit about your experience of learning with others; who do you prefer to ask questions of when you do not understand? (teacher, students, family,..)
Areas to cover: interrogating and sharing with others

d) Reading experience

How often and how much do you read digital texts in Spanish now and in the past? What do you read? For what purpose and how? Do you enjoy reading in general? What type(s) of books and articles do you like to read? Have you taken any reading strategy classes?

Areas to cover: reading experiences in their mother tongue and in a foreign language

e) Views on technology

How do you use the Internet? Where do you access the Internet from (mobile phone, laptop, stationary computer)? Do you use social media (blogs, Facebook, YouTube)?

f) FL reading strategies use while reading with iPads

Questions related to the planning and preparation stage

What did you do first when you began to look at the text?

Did you plan how to read it?

Did you have any questions or predict what would be included in the text you were about to read?

Did you look at the pictures?

Did you read the title or not? What went through your mind when you read the title?

Did you relate that to your previous experiences?

Questions about the reading process

How did you approach reading ?

Did you read from the beginning to the end without a break? Did you stop during the reading or after each paragraph? Where/when did you stop? Why? What did you do then?

Were you confused during the reading process? What, specifically, made you confused? What did you do when you were confused? (Did you go back to the previous text during your reading? When and why? Did you relate it to your previous experience or prior knowledge on a particular issue?

Could you describe the process after reading the title? What did you do?

What helped you understand the whole meaning of the passage?

Did you have any tricks to understand meaning? What do you do in order to understand the text?

Were there words that you did not understand or were not sure of? What were some of them?

Did you check your comprehension while you were reading?

What did you do when you didn't understand the meaning of a particular word?

Did you use context clues? Did you apply grammatical rules to understand the language?

Did you use previous knowledge to understand the overall meaning?

Did you write anything in the process of reading? Where (on paper or using the note function on the iPad)?

Did you practice the pronunciation of any word in your mind as you were reading?

Did you check the pronunciation?

Questions about the reflective stage

What did you do after reading the text?

What did you do to check the main idea of the text?

Were you trying to summarise the opinion of the author? When did you do that? How did you do that?

Did you read the 3 texts in similar or different ways? How? Any examples?

Do you think you understand the opinion of the authors well? What made you think so?

In general, what problem(s) present the greatest difficulty for you in reading Spanish? Why?

Is there anything else you would like to say about your reading experience?

g) Technology-mediated reading

Can you describe your experience of the iPad?

Did you read the explanations of reading strategies in the prompts in the texts?

Did you learn about reading strategies with the embedded prompts?

What other functions of the iPad encouraged the use of reading strategies?

How did function X encourage you to be aware of reading strategies?

Any application? Dictionary, MP3, note-taking, highlighting, pictures?

How can the iPad assist your learning process? In what way?

What kind of problems have you encountered with the technology?

Problems concerning changing the display format? (Read in full screen mode, Rotate 90 degrees clockwise to read, Zoom function, Exit the full screen mode?)

Problems concerning navigation? (Back to the last two pages you visited; Jump to the first page that contains a picture; Scrolling; Jump to page X?)

Problems concerning searching?

Problems concerning basic operation of the iPad?

Appendix 6: Student log (MAIN STUDY)

The questions below were translated into Danish.

Note down what you have done to understand the text. Give specific examples.	
Which functions of the iPad have you used? Give specific examples.	
Which advantages and disadvantages have you found in reading with an iPad?	
Summarise the text in Danish in your own words.	

Appendix 7: A sample of researcher's log

A sample of the researcher's reflections after the interview with Mette
November 20th, 2012

Interviewee was very talkative, I tried not to
interrupt (I could see from the transcripts in the
pilot I did not let finish or interrupted the interviewe)
- Good atmosphere
  No problems (light, noise, camera)
Showed her iPad without asking her
                          ∨
                     and how she read and used it

St. Explains in her words things as strategies
  → "tactics" background knowledge "det
  man tror man ved"

✱ Hjælp strategier at forstå? → Man bliver
  mere bevist om det

her downloaded → Dropbox, Goofe Earth
  apps   (regise)
            Ebooks

↳ (☞ I think she was prepared to the pestion
  " Can you explain about your experience with
  the iPad" because she participated
  in the interview in the pilot

APPENDIX 8: e-books developed for the study

The format used for the study was a proprietary format created by iBook Author. Below, the e-book has been converted to a word document.

Los jóvenes mexicanos

Natalia Auer, Ana Cristina Hernández Coronado, María Luisa Morales Guerrero, Brenda Cecilia Padilla Martínez.

Image courtesy of Ambro/ FreeDigitalPhotos.net

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Jóvenes de México y la tecnología

Ana Cristina Hernández Coronado

Image courtesy of David Castillo Dominici / FreeDigitalPhotos.net

¿Qué sabes tú de los jóvenes de México y el uso que hacen de la tecnología?

TUS CONOCIMIENTOS	INFORMACIONES TEXTUALES	INFORMACIÓN RETENIDA

Rellena la primera columna del cuadro siguiente con tus conocimientos, lee el texto y rellena la segunda columna.

Ahora piensa e indica en la última columna qué información retienes y cuál rechazas. ¿Por qué?

Los jóvenes de México y la tecnología

Ana Cristina Hernández Coronado

La tecnología ha impactado en la vida de jóvenes de entre 14 a 24 años en México. En la actualidad la televisión *se está quedando* atrás como medio de entretenimiento. Internet, teléfono celular y videojuegos son las principales tecnologías que utilizan.

Trata de adivinar el significado de "se está quedando atrás"con la ayuda de tus conocimientos del mundo y del texto (con la auyda de las palabras "Atrás" y "televisión")

Además de ser usadas

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como *entretenimiento*, son un medio educativo en las universidades; en las escuelas se han incorporado aulas inteligentes para tener la tecnología al alcance de los estudiantes.

Trata de adivinar "entretenimiento" por tus conocimientos de inglés

Lav forbindelser mellem teksten og egne erfaringer

La forma de acceso a estos medios es el hogar o los *cibercafés*. En la mayoría de los casos no hay una supervisión eficaz de los padres que evite el acceso a páginas restringidas o que tengan contacto con personas desconocidas que utilizan estas herramientas de forma incorrecta y los pongan en peligro

¿Has estado en un cibercafé? Qué inconvenientes puede tener para los jóvenes?

Sus hábitos y capacidades han cambiado. El comunicar situaciones con menos *caracter*es es algo cotidiano pero provoca que tengan un vocabulario pobre.

Trata de adivinar el significado de "caracteres" con la ayuda de tus conocimientos del mundo y del texto ("menos" y "vocabulario pobre"

Para los jóvenes la tecnología representa la oportunidad de tener más amistades y de hacer más fácil la vida, es ya casi inconcebible la vida sin celular, internet, redes sociales y demás. Tambien trae como consecuencia el que se vuelvan **perezosos** por las facilidades y ventajas que estas aplicaciones ofrecen. Por ejemplo, al buscar una tarea sólo basta con teclear en el **buscador** el tema y encontrarán mucha información sin tener que permanecer por horas en una biblioteca. Además no comprueban qué tan verídica es esa información.

Redes sociales

Image courtesy of smarnad / FreeDigitalPhotos.net

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Con el uso de las redes sociales y de los teléfonos inteligentes **evolucionó** la forma de comunicarse **Se creía** que las redes sociales **aislarían** al individuo. Esto se puede considerar un mito ya que con las personas que chatea mantiene contacto en su vida real. Sin embargo ese contacto se vuelve impersonal.

Actualmente es común contar con un teléfono inteligente, que permite tener aplicaciones para saber del clima, y lo que pasa

Chica con celular y ordenador portable.

Image courtesy of David Castillo Dominici / FreeDigitalPhotos.net

en el mundo y en las redes sociales. Además existen aplicaciones que permiten tener un mini escáner o editor de fotografías en el celular. ¡Y todo esto **al alcance de su mano**!

Algunos jóvenes **reconocen** que representa una adicción tener acceso a tantos medios tecnológicos y han confesado distraerse en clase o mientras van a casa, *revisando el perfil de un amigo* o jugando con el teléfono celular.

Contar con nuevas tecnologías los ha vuelto **sedentarios** y se ha incrementado la obesidad en México. Con ello se puede concluir que la tecnología tiene **pros y contras** y debemos concientizar a la población de esto. El papel del gobierno y la sociedad es guiar a los jóvenes a realizar actividades que les permitan aprender en línea, contar con maestros mejor preparados en el uso de las tecnologías y padres responsables en la educación de sus hijos.

Adivina el significado de "revisar" con la ayuda de tus conocimientos de inglés. ¿Tienes un perfil en Facebook?

TEXTO 2

Los jóvenes de México y el trabajo

María Luisa Morales Guerrero

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Los jóvenes de México y el trabajo

María Luisa Morales Guerrero

> **Identificer de vigtigste informationer i afsnitet.**

La situación laboral para el joven mexicano actualmente es difícil. Por un lado, hay jóvenes con poca o nula educación académica, que no tienen oportunidad de encontrar un trabajo bien remunerado. Trabajan en la calle o campo, por lo que son punto de atracción para las organizaciones delictivas que buscan reclutarlos ofreciéndoles sueldos que difícilmente podrían recibir si **trabajaran** en el sector empresarial. Por otra parte, están los jóvenes con estudios profesionales, que al finalizar su carrera, pueden pasar meses o años sin obtener un trabajo bien remunerado. Mi-llones de estos se ven en la necesidad de trabajar en actividades no relacionadas a sus estudios, como taxistas, comerciantes u operadores telefónicos.

> **¿Cuál es la idea principal de este párrafo? Exprésala con tus propias palabras.**

> **Afgør hvad er det, der vanskeliggør forståelsen af en sætning.**
>
> **Hvad går strategien ud på? Nogle gange kan du forstå et afsnit uden at forstå et ord eller en sætning i afsnittet. Imidlertid afhænger nogle gange forståelsen af et afsnit af at kunne forstå en enkel sætning.**

Uno de los obstáculos que encuentran son las políticas de contratación de las empresas que evitan a jóvenes profesionistas sin experiencia. Los jóvenes se preguntan cuándo podrán adquirir la experiencia que las empresas piden si carecen de oportunidades para adquirirla. Por otra parte, existen empresas que ofrecen la oportunidad a los estudiantes de realizar prácticas profesionales y con ello adquirir la experiencia necesaria soli-citada. El joven estudiante que decide realizarlas, debe reflexionar en los beneficios que trae el practicar en lo que trabajará toda su vida.

> **Si la frase es muy larga, intenta acortarla en varias frases. Por ejemplo: Un obstáculo que encuentran los jóvenes es la política de contratación de las empresas./Muchas empresas tratan de evitar a jóvenes que no tienen experiencia.**

Image courtesy of imagerymajestic / FreeDigitalPhotos.net

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Hay algunos puestos de trabajo que están reser-vados al sexo masculino, de-jando sin oportunidad a muchas mujeres que se encuentran preparadas para desem-peñarlos. También, los hombres reciben una mayor remuneración por su trabajo que las mujeres, aun cuando realizan las

Empresa maquiladora

mismas actividades y trabajan la misma cantidad de horas.

El problema no es sencillo pues el sector empresarial ha privi-legiado a la maquila y/o la exportación de productos. Req-uieren jóvenes con estudios "técnicos", con **estudios de se-cundaria**, que desempeñen actividades técnicas u operativas en las empresas maquiladoras o exportadoras.

Hoy en día, jóvenes con edades de trabajar, cuentan con nive-les muy bajos de estudios o con estudios profesionales, pero no cumplen con los requisitos que solicitan en las empresas. Si ingresan, es con sueldos muy bajos.

Algunas soluciones que deben proponer las autoridades guber-namentales, empresariales e institucionales educativas son: Formar un vínculo estrecho entre ellas para generar un esce-nario laboral y académico menos complicado; reducir la tasa de desempleo y ofrecer trabajo a todos; aumentar el factor so-cioeconómico de cada individuo y bajar toda clase de delitos.

El reto está... Tenemos una generación de estudiantes que ahora se preocupa e involucra en la situación política de nues-tro país, buscando para su futuro fuentes de trabajo bien remu-neradas.

La solución y voluntad de hacerlo es de todo y para todos...y así tendremos un México mejor para nuestra juventud.

y

TEXTO 3
La familia en México

Brenda Cecilia Padilla Rodríguez

Image courtesy of imagerymajestic /
FreeDigitalPhotos.net

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La familia en México

Brenda Cecilia Padilla Rodríguez

La familia es la unidad básica de la sociedad. Ayuda a satisfacer las necesidades físicas de refugio, vestido y alimento. Dentro de ella se aprenden valores, normas, actitudes y patrones de conducta. Además, la familia se caracteriza por lazos duraderos de afecto y lealtad entre los miembros. Para los mexicanos, el grupo familiar es más importante que el individuo.

En México, la familia ha evolucionado con el tiempo. En la época *prehispánica*, el concepto de familia se daba en términos de co-residencia y cooperación económica. Era esencialmente un grupo de personas que vivían juntas y se apoyaban para satisfacer sus necesidades de abrigo y alimento. Los hijos representaban una fuerza de trabajo disponible para cultivar la tierra.
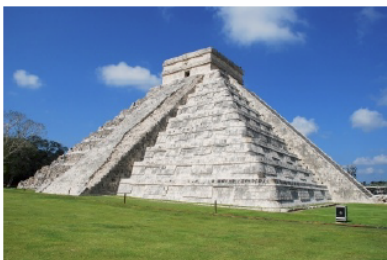

Image courtesy of Gnecco/
FreeDigitalPhotos.net

Más tarde, durante el periodo colonial, la familia sufrió algunos cambios. Los matrimonios eran comúnmente arreglados por la parentela. Las relaciones entre los miembros eran desiguales y se caracterizaban por ser distantes. El hombre tenía el poder. Era su derecho disciplinar a su esposa e hijos, quienes debían someterse a su autoridad. A cambio de una obediencia absoluta, el padre de la familia, proveía apoyo, protección y dirección.

Edificio del periodo colonial: Castillo de Chapultepec.

Foto:Carlosr chill

Esta tendencia se mantuvo hasta mediados del siglo XIX, cuando surgió la familia nuclear conyugal. El matrimonio se instauró como un contrato civil, que permitía a las personas elegir libremente con quién deseaban casarse. Los esposos podían separarse de su parentela, vivir en su propio espacio y trabajar para sí mismos. La familia se volvió un espacio para la domesticidad, la intimidad, el amor romántico, el cul-

tivo de la niñez y el afecto. Las mujeres desarro-llaron un papel más privado. Se enfocaron en atender a su esposo y a sus hijos. Los hombres definieron públicamente su papel de proveedores y encargados de la movilidad social de la familia (Esteinou, 2004).

x

Así, la familia nuclear, compuesta por padres e hijos, fue adquiriendo poco a poco mayor importancia. A partir del siglo XXI se dio una revalorización de la familia en la sociedad. Incluso se dice que la frase "la familia es primero" fue el primer nacionalismo mexicano (Zaid, 2005). En México, la familia puede llegar a pesar más que la ley.

Sin embargo, la familia ha continuado su constante transformación. Actualmente hay menos matrimonios y los divorcios son más comunes. Otros tipos de familia han surgido, como las monoparentales (con un solo progenitor encargado de los hijos), las binucleares (con ambos padres interesados en criar a los hijos después de un divorcio), las encabezadas por los abuelos (quienes se encargan de los nietos) y, en un menor grado, las familias que incluyen una pareja homosexual (Ritvo y Glick, 2003).

Aun con todos sus cambios, la familia continúa siendo una unidad social importante en México. Cumple con funciones básicas, como cubrir las necesidades de los hijos, apoyar en momentos de crisis y ser fuente de enseñanzas.

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