An exploration of the equivalence of print and online ELT activities in terms of reading comprehension, and how such online activities can be designed to support L2 students.

1. Introduction

In English language teaching (ELT), reading is a very important part of a school’s syllabus, with students being shown strategies to enable them to successfully comprehend these L2 texts. While this has predominantly been focused on print texts, students are increasingly using computers and tablet devices to complete ELT activities. Research remains divided as to the equivalency of such online activities which has profound implications for ELT content development and publishing. This study will, therefore, explore reading comprehension both on paper and digitally to determine any differences in L2 student comprehension before considering how online activities may be presented in order to ensure a supportive and optimal reading experience.

2. Context

I have been involved in ELT for around 14 years having been based in Japan, Spain, China and, now, the UK. For the past five years, I have been involved in product development and publishing, producing online and offline materials for English language learners. Now that I am based in London, my work in publishing and materials development is continuing but with a more global perspective. There is also a greater emphasis on the digital materials that are to be produced as I am involved in an ELT blended learning course that involves the production of closely integrated digital and print components. Indeed, senior
management has indicated they are committed to digital publishing throughout its education business. In general, this sentiment is one that has gradually been taking place over the last ten years and is presenting many challenges for education and ELT.

3. **Research purpose**

The purpose of this research is to explore the reading comprehension of adult ELT students between 18 and 25 years of age and of an intermediate level of English (B2 of the Common European Framework of Reference for languages (CEFR)). It will explore their reading comprehension abilities using paper and online-based ELT reading texts. As ELT students across the world are often able to select whether they take English classes in a classroom, 100% online or a combination thereof, will their reading comprehension be disadvantaged by the option they select? Furthermore, as a developer and editor of both print and online materials, I am interested to see if there is a particular way ELT students can be adequately supported when encountering reading texts presented in different media. As a result, this research will be able to contribute meaningfully to the production of pedagogically sound online activities for computer and tablet devices at a time when such materials are becoming an increasingly important course component for ELT publishers.

4. **Literature Review**

Reading activities are a typical facet of the ELT classroom with students being exposed to a variety of topics from travel and tourism to history and science. Within printed textbooks, such reading passages are necessarily graded according to the student’s level and are further supported with images, photography and illustrations. ELT courses are being
produced with online components for computer and tablet devices that either provide a review of the classroom teaching, or present completely new material. Such activity types include reading and listening gap fills and multiple choice questions that are created using pre-prepared templates, basic examples of which are shown in Appendix 1. These templates are much less flexible in terms of instruction length, activity word count and the inclusion of audio and photography. While students will use the textbook and other materials in the classroom with the support of the teacher, online activities are often completed at home as part of a self-study component of the course. Consequently, a student transitioning from a supportive classroom environment to online self-study of reading activities via a computer or tablet device may find that transition difficult to deal with in terms of their reading comprehension due to the lack of comprehension cues such as images or illustrations.

Regardless of the type of text being read, reading comprehension involves, "the process of simultaneously extracting and constructing meaning through interaction and involvement with written language" (Rand Reading Study Group, 2002:11). According to Anderson and Pearson (1998), a reader's understanding of a particular text depends on her schemata. Schemata relates to the background information already known by the reader. This existing knowledge enables interaction and involvement with the text and helps construct meaning (Pardo, 2004). This is particularly important because, according to Kant, "new information, ideas and concepts can only have meaning when they can be related to something the individual already knows" (Carrell and Eisterhold, 1983:73). This background, or prior knowledge according to Coiro (2011), is just as important in an online reading environment. Online readers with high levels of prior knowledge in terms of topic and technological systems tend to be better able to navigate and comprehend information presented online.
However, a lack of prior knowledge in respect of any reading text, "makes the decoding process even more difficult" (Lin & Chen, 2007:83).

Many ELT publications acknowledge this background knowledge in the production of print textbook materials through the inclusion of pictures and illustrations next to reading texts to assist learners in understanding the context. In fact, multimodal approaches to reading, where there is an amalgamation of written text, audio, video and images, have often proved successful in assisting students who have reading difficulties comprehend a text (Ortlieb et al., 2014). However, the type of online activities typically produced for ELT students may not take full advantage of such a multimodal experience due to, in my experience, budgetary considerations and difficulties implementing the technology in markets that do not have stable access to the internet. Despite these difficulties, it is important to consider that according to Schema Theory, the text being read does not in and of itself, carry meaning (Carrell & Eisterhold, 1998). The text merely provides signposts that the reader follows in order to enable new information to interact with existing background information, an interaction that leads to comprehension. However, in order for this interaction to be successful, there has to be an activation of both formal and content schemata, something that may be difficult for ELT students studying online if comprehension cues such as images or video are not available.

Formal schemata, according to Carrell and Eisterhold (1983), considers the overall structure of a text. Content schemata, on the other hand, is the background knowledge the reader brings to the text. If either or both types of schemata fail to be activated, there will be no comprehension of the text. Liu (2015) would agree although further posits that it is the order of activation that is crucial for comprehension. She discusses meaning and form
which closely resemble content schemata and formal schemata respectively. Liu (2015) contends that meaning coming before form provides the optimal means of processing a text (VanPatten, 2004). This would suggest that content schemata, the background knowledge that is instrumental in making new meaning, must occur before formal schemata. Simultaneous activation for L2 students would result in comprehension being negatively affected since students may be unable to cope with such multiple processing. One of the schemata would be processed at the expense of the other (Liu, 2015).

Meaning-based processing and form-based processing being generally separate and sequential for L2 learners has particular implications for the production and presentation of ELT materials, whether they be in print or digital. Much has been done in print materials and in the classroom to ensure there is a strong emphasis on context that is realistic and either has been or could be experienced by the student. This very much feeds into the notion of presenting meaning first and concentrating on activating that background knowledge before moving onto any reading or other activities. The establishment of context along with other comprehension cues like photography and illustration very much helps with content schemata activation and would suggest it takes precedence. However, when it comes to replicating reading texts and associated activities online, the limitations of the activity templates used would make the activation of content schemata much harder.

Noyes and Garland (2008:1362) note that, “when tasks are moved from pen and paper to the computer, equivalence is often assumed, but that is not necessarily the case.” Although they were specifically discussing testing and assessment, equivalence is just as important when considering texts that are being reproduced online for general English purposes. Despite their research showing no statistical difference between paper and computer based
reading comprehension, Noyes et al. (2004) believe that there is a great deal more cognitive effort required when completing a computer-based task. Consequently, any assumption that a student’s reading comprehension will be consistent across print and online formats because they are considered equivalent may not be entirely sound.

With online activities, the student is sometimes completing these alone as part of a self-study course. Since the teacher is not present, the activities themselves have to be as supportive as possible and that can be problematic. The question is, and this is also considered by Liu (2015), whether such activities are set up in a manner optimal for comprehension. As Liu (2015:37) indicates, “it cannot be assumed that content presented in a paper-based modality will necessarily invoke and/or require the same process as when the identical content is presented digitally.” This would further suggest that Noyes and Garland’s (2008) notion of equivalence is not present when considering print and digital content, indicating that if comprehension is achieved in one medium, it may not necessarily be so in another.

The issue of non-equivalence appears to be borne out in some of the research conducted on the subject of reading comprehension. Mangen et al. (2013), for example, examine the reading comprehension of 72 Norwegian primary school students, with one group reading texts on paper, and another reading the same texts as an on-screen PDF. They found that the students reading on paper performed better in terms of comprehension than those reading from the screen. Hosseini et al. (2014) studied English language learners in Iran using Paper-Based Tests (PBT) and Computer-Based Tests (CBT) and find, similar to Mangen et al. (2013), that the participants performed better on the PBT than the CBT.
Nevertheless, the research into equivalence is not so clear cut according to Subrahmanayam et al. (2013) and they assert that the research has been inconclusive in terms of the equivalence debate. For example, Holzinger et al. (2011) studied a group of Austrian medical professionals reading medical texts using paper and digital media and found that reading performance was not affected by the media used. Furthermore, Subrahmanayam et al.'s (2013) own study revealed similar results with a group of Californian university students. When they were asked to read both an easy and difficult text on paper and digitally, the difference in reading medium did not affect the participants’ reading performance. Additionally, when the participants were asked to write a report about what they had read, again the reading medium did not affect performance of that particular task.

Johnson and Green (2004:2) suggest that, “computer technology […] needs to be seen to at least match the levels of validity and reliability of the paper and pencil assessments that it hopes to replace.” As those in ELT publishing are not necessarily seeking to replace printed student books with digital versions and online activities, it is important to consider what action needs to be taken to ensure that online activities can be considered equivalent to their print counterparts so that they are, therefore, providing an optimal reading experience for L2 students.

Liu (2015) provides insights into the potential design of online computer or tablet-based activities in order to determine whether optimal reading comprehension conditions can be achieved. Online reading activities could be designed to provide greater support with comprehension cues such as photos, illustrations or glosses being provided for the benefit of the learner. Currently they either offer no comprehension support or simple comprehension support (Liu, 2015), with only one comprehension cue being present (see
Appendix 1). However, Liu (2015) and Jones and Plass (2002) both advocate the use of compound comprehension support cues to enable students to build a more sophisticated memory trace of the text’s content that can be more easily remembered later (Chun & Plass, 1996). Although it is clear that compound comprehension support would be of benefit to an online reading environment, it is unclear as to how this should actually be presented (Abuseileek, 2011). It would be necessary, therefore, to consider where and how these comprehension cues be placed within an activity to encourage greater support for the learner.

Consequently, this research study will first look at print, computer and tablet-based ELT reading activities to determine whether they are equivalent in terms of reading comprehension outcomes. In addition, it will go on to examine the potential design of online activities to try and establish how compound comprehension cues can be built in to encourage optimal reading comprehension conditions.

4.1 Research questions

The research questions relating to this study are as follows:

RQ1: To what extent are ELT reading activities produced for print and replicated online for computers and tablet devices equivalent when testing the reading comprehension performance of around 255 intermediate adult non-native English language learners?

Since RQ1 seeks to determine the equivalence of print, computer and tablet-based reading activities, this will be tested against a null and alternative hypothesis:
Null hypothesis: the mean test scores for the Paper-based test (PBT), Computer-based test (CBT) and Tablet-based test (TBT) are the same, meaning these different media can be considered equivalent.

Alternative hypothesis: the mean test scores for the PBT, CBT and TBT are not the same, meaning these different media cannot be considered equivalent.

RQ2: Referencing the same group of intermediate adult non-native English language learners, what support cues should be presented in ELT reading activities for print, computer and tablet devices and how should these be presented to provide the greatest level of support for L2 learners?

4.2 Relevance, originality and contribution to knowledge

This research is particularly relevant in terms of the work I am currently undertaking in ELT publishing. In my work context, a large scale project is underway that will offer students the opportunity to study in the classroom as normal, study completely online or a combination of the two. The fact that much of the research to date has resulted in inconsistencies regarding the issue of equivalence suggests that this research project can provide a useful contribution to that debate. This debate is of vital importance since students and teachers need to be assured that learning outcomes will be met no matter which study mode a student selects. This research can also feed into the potential design of online activities to ensure they are optimized for reading comprehension.
In terms of originality, the central focus of this project is the fact that it is looking at equivalence between print and online activities. From the perspective of Noyes and Garland (2008), and others, equivalence has been explored in terms of testing and assessment. Consequently, this research is seeking to expand this concept of equivalence into the area of general English language learning where it is believed it has particular relevance.

Additionally, as indicated by Mangen et al. (2013), much research has to be done on other devices such as tablets. By investigating tablet devices as well as computer screen reading, this research has the ability to expand knowledge in that area. This aspect of originality is further expanded through examining the problems non-native English language learners might have with reading on paper, on computers and on tablets, a different perspective from much of the research that has tended to focus on native or near-native speakers. As a result, this research will try and address this gap through specifically involving non-native learners of English. Liu (2015) and Abuseileek (2011) consider the presentation of activities on different devices for EFL students although, as acknowledged by Liu (2015), their research does not fully consider how the likes of comprehension cues be placed within such activities. Therefore, this research will build on that by specifically asking how comprehension cues can be built into activities for computer and tablet users.

5. **Research design**

5.1 **Paradigmatic Standpoint**

My paradigmatic standpoint has often moved between post-positivism and interpretivism due to the nature of the work I have undertaken. As a consequence of my teaching and
school management work, I was frequently undertaking interpretive research, solving problems in the classroom that were not intended to be generalised to a larger population. This fits well with Crotty's view of constructivism as, "meaning making of the individual mind," (Crotty, 1998:58), examining specific issues in a local classroom that accorded well with Vygotsky's Zone of Proximal Development and L2 students progressing at differing rates through it.

However, with both school management and publishing, there is also a positivistic aspect that requires more data-driven business decision-making. Senior managers in organisations often look for, "hard, objective and tangible" data upon which to base their decisions (Cohen et al., 2007:7). Consequently, I have often moved between classroom-based interpretive research and post-positivist research that contributes to business decision-making, often one influencing the other. This movement along a paradigmatic spectrum or "continuum", according to Johnson and Onwuegbuzie (2004:15), was very much an unconscious act, one that was instinctive and, "in the muscles" according to Dewey (Biesta & Burbules, 2003:11). While this presented different ways of researching that offered, "the best opportunities for answering important research questions" (Johnson & Onwuegbuzie, 2004:16), it was not until later that I began to verbalize this as being more akin to Dewey's pragmatism.

Dewey sees pragmatism as being a philosophy of action, very relevant for educational researchers who wish to deal with knowledge from a practical perspective. However, it was anti-epistemological in that it rejected the immaterial mind acquiring knowledge of the material world outside of the mind. Instead, he suggested that rather than there being a dualism between mind and outside world, there were instead transactions taking place
between the human mind and its environment. These transactions constantly build and rebuild as changes in the environment influence the types of action taken, a form of transactional constructivism, whereby our knowledge is a construction that is also based on reality. Consequently, the business and classroom transactions I have experienced have constantly shaped and reshaped my researcher's mind to one that has become more adaptive of its environment, a transformation of impulse into habit (Biesta & Burbules, 2003).

It is through these constant transactions within the educational environment within which I operate that I have become able to balance paradigms that many often see or have seen as being in competition. Indeed, Dewey rejects this paradigmatic competition when he indicates that he does not recognise the distinction between inquiry that is based on normative or prescriptive logic and that which is focused on empirical or descriptive methodology (Biesta & Burbules, 2003). This would seem to suggest that some sort of "peaceful coexistence" between these different standpoints (Venkatesh et al., 2013:22) can be achieved. Dewey’s rejection is reminiscent of the hermeneutic circle described by Baert (2005) and the double hermeneutic outlined by Sayer (2000) with the natural science’s fallibilist philosophy on the one side and its acknowledgement of the social sciences on the other. This hermeneutic circle is, I believe, representative of the paradigmatic spectrum mentioned above, with crossover between the natural and social sciences.

From the perspective of reading and reading comprehension, there is a sense of transactions taking place between the reader and the text. The fact that, according to Schema Theory, prior knowledge is being drawn upon and constantly built on, potentially influences the reader's experience and, therefore, the actions they may take within their
environment. As a result, it is believed that pragmatism as a paradigmatic standpoint is compatible with Schema Theory due to their links with transactional constructivism, the continual rebuilding of knowledge being critical to the achievement of reading comprehension.

5.2 Theoretical framework

Since pragmatism places great importance on the, "reality and influence of the inner world of human experience" (Onwuegbuzie et al., 2009:122), this can be considered a vital component as ELT materials and activities are often produced that are more akin to a one-size-fits-all model. Not only does this bring Noyes and Garland's (2008) assumption of equivalence into play, it also does not recognize the personal interplay between reader and text that influences the individual world of human experience.

In order to find, "ways in which existing realities may be changed" (James, 1907:45), this notion of direct equivalence between activities produced for print and those for computers and tablet devices needs to be questioned. It is felt appropriate to attempt to do so through research that adopts a mixed methods design, acknowledging the hermeneutic circle of quantitative and qualitative methods. My pragmatic standpoint will enable the collection of quantitative data relating to reading comprehension scores along with supportive qualitative data that explore these scores and issues in more detail, considering how online ELT activities might best be presented to optimize students' learning experience.
5.3 Data collection tools and methods

In order to collect data for both research questions, a sequential explanatory design will be employed. RQ1 represents the primary quantitative data element with RQ2 the secondary qualitative element (Creswell, 2009). The secondary qualitative element will provide data that helps further explain and provide deeper understandings as regards the primary quantitative data, a supportive role according to Creswell and Plano Clark (2007). Furthermore, the secondary qualitative data can, according to Morse (1991), provide insights into data arising from the quantitative stage that was surprising and unexpected.

5.3.1 Phase 1 – Quantitative element, Research Question 1

It is proposed that five reading texts be written that can be reproduced in print and online. These will be original and up to 500 words in length each. In my work context, there are several similar ELT textbooks containing, on average, five texts to read within a unit. They will be based on topics such as business and employment, innovation, invention, culture and lifestyle. These topics are all listed in my work context's intermediate level syllabus and some are fairly typical of the types of topic students encounter in ELT classrooms. Although the participants may be familiar with the topic, they will not have read these specific texts previously.

The print-based texts will be produced in a similar style and pedagogical approach as an ELT textbook. There will be instructional text, photography and illustrations included. The same texts will be reproduced as computer and tablet-based activities using templates similar to those in regular use in ELT publishing, reproduced as part of a basic website. The
participants will, therefore, either work with the paper textbook pages or with the online website via computer or tablet.

Up to 255 ELT students will be recruited to participate in this phase of the research study. They will be randomly assigned either to the print-based test (PBT), the computer-based test (CBT) or the tablet-based test (TBT) groups. It is proposed that this be conducted at the participants' school but separate from their regular course studies. They will either be presented with the pre-made textbook pages or given access to the activity website. The students' regular teacher along with the researcher will be present to ensure students complete the tasks and to assist as appropriate.

Each participant will take part in a pre-test to determine their current level of English to ensure they are of an intermediate level. According to Charters (2003), an intermediate level for task types is seen as being challenging but not cognitively overwhelming, thus avoiding automatic responses from participants. Furthermore, participants will be asked to provide some basic information regarding their English studies as well as general reading habits outside the classroom.

Each group will then complete their assigned reading tasks. The students will be asked to read Text 1 and complete four activities that follow. Participants may refer to the original text while completing these activities. Although there is no assigned time limit, it should not take more than 20 minutes to complete one round of reading and activities. Once the reading activities are complete for Text 1, the students will take a break of 20 minutes following which they will complete a free recall task where they will write, in their own words, the main points relating to Text 1, without reference to that text. The students will be
marked according to the number of relevant main ideas they manage to include. A similar approach was adopted by Liu (2015) whereby participants would try and recall salient points of a text as a means of showing that key material had registered cognitively and, thus, moved towards becoming stored knowledge. This process will be repeated with the other four texts. A total score for each of the five texts will be calculated.

*Quantitative data analysis*

To analyse the data for this part of the study, the PBT, CBT and TBT groups will be treated as independent variables with the resulting test scores the dependent variable. The test scores will be of a continuous nature (Creswell, 2009). A control variable relating to Schema Theory and the participants' pre-existing knowledge will also be included as this will potentially have an effect on the dependent variable. It is proposed that the control variable be the number of hours participants spend per week reading for interest. Those who spend more time reading outside the classroom are likely to be adding more information to their pre-existing knowledge base, thus potentially influencing their test scores. Consequently, an analysis of covariance (ANCOVA) test can be employed (Creswell, 2009). Given a significance level of p=0.05, the null hypothesis will either be rejected, with the alternative hypothesis thus being accepted, or will fail to be rejected with the alternative hypothesis being rejected. That will enable a determination to be made as to equivalence.
5.3.2 Intermediate stage

Prior to the commencement of phase 2, an intermediate stage will allow for the quantitative data to be analysed as described above. However, according to Ivankova et al. (2006) such a stage also enables the initial quantitative phase to be connected to the secondary qualitative phase. This is important as the quantitative data is to inform the selection of participants for the upcoming qualitative phase. It is thought the qualitative selection procedure can be replicated from Ivankova & Stick's (2006) study whereby participants were selected from four groups with a mean score within one standard error of the mean using the cross-tabulation function in SPSS. Comparisons were made to demographic variables and a maximal variation sampling strategy was used to further reduce candidate numbers (Ivankova & Stick, 2006). Although the number of candidates selected was small, Ivankova and Stick (2006) were concerned with the richness of the data that those participants could provide. Consequently, it is thought that this method of participant selection can be used to identify approximately 15 typical participants, five from each of the three test groups, this number still providing rich data but also being more representative.

5.3.3 Phase 2 – Qualitative element, Research Question 2

For the first part of stage 2, the participants will discuss their thoughts and feelings relating to their performance on the phase 1 reading tasks. It is thought that a one-to-one interview format conducted via Skype would be an appropriately private means of doing so. In order to try and achieve a balance between the agenda of this project and the perspectives of the participants, a top-down, hierarchical interview process will be adopted (Tomlinson, 1989). At first general questions will be asked to ascertain general thoughts and experiences of
online and classroom study. From there, the questions will gradually become more specific
to cover thoughts and feelings of the activities just completed, and how supported the
participants felt. During this part of the interview, there may be opportunities to probe further
depending on what the participants say, particularly regarding the issue of equivalence and
the presentation of comprehension cues. These interviews will be audio recorded and
subsequently transcribed.

Further evidence as to what support cues can be used and how they can be used can be
obtained through a think aloud protocol. The same phase 2 participants will work through
texts and activities and provide a think aloud commentary, giving their thoughts and ideas
as to the usefulness of the support cues provided as well as how they are presented.
Cotton and Gresty (2006:48) suggest that such a method can provide insights into the,"thought processes or decision making of someone performing a specific task." Indeed,
Vygotsky thought of the think aloud as a verbalisation of a person's thought processes
(Charters, 2003). Ericsson and Simon (1993) expand on this by indicating that the think
aloud protocol draws on short term memory, an area of limited capacity. As all cognitive
function passes through this area of short term memory, the participant's thought processes
can be recorded by the researcher at the time they are being processed.

It will, therefore, be necessary to create online activities that include different levels and
combinations of support. For example, one scenario will include no support cues and a
second will contain only photo support, these being representative of the types of online
activities currently being produced. The remaining scenarios will include different
combinations of photo, audio and L2 gloss support. As before, there will be five sets of
activities that include these different levels and combinations of support. Although the
sample size is potentially quite small, the think aloud method is very labour intensive. A small sample does not necessarily mean a small data set (Johnstone et al., 2006). In fact, Nielsen (1994) indicates that it is possible to conduct such protocols with as few as five participants and still collect enough data to provide meaningful insights.

Each participant will work through to completion the activity scenarios and will receive a score for each. This will be done using the website as before, and will be conducted individually in the participant's school.

The participants will be encouraged to verbalise their thoughts and feelings as they complete each of the activities. These think aloud commentaries will be audio and video recorded. Audio recording would be less intrusive and distracting for the participants with video being used to synchronise the audio with the section of the activity being worked on. Once each participant has completed the activities and the think aloud commentary, there will be an opportunity for a short retrospective questioning session to follow up on any points that need to be clarified.

**Qualitative data analysis**

The transcribed interview and think aloud data will be analysed thematically using Braun and Clarke's (2006) phases of thematic analysis. Once familiar with the data, it will be necessary to code it. The interview data will involve two coding cycles. The first cycle will employ in vivo coding, using codes that are generated directly from the participants (Saldaña, 2009), preserving intended meaning and ensuring the participants' voices are heard. This will be followed up by a second round of pattern coding that can help group the
data into more meaningful categories and themes (Saldaña, 2009) relating to equivalence and the use of support cues.

The think aloud transcripts will also go through coding cycles, the first involving product and in vivo coding. Product coding will help analyse which of the participants' activity answers were correct or incorrect. The in vivo coding will then help match participant utterances, specific thoughts and feelings, to those activity answers, pairing an utterance to an answer. The second cycle will use process coding to analyse the video recordings to look for observable behaviours like reading or struggling (Saldaña, 2009) in order to, "search for ongoing action, interaction, emotion taken in response to situations or problems" (Corbin & Strauss, 2008:96-97). The think aloud coding can bring together the scores, participant utterances and behaviours to reveal any potential themes.

Once coded, it will be possible to search the qualitative data for themes that can be related back to the research questions (Gibbs, 2007), ensuring they provide relevant insights into the best activity presentation format and support cue combinations.

### 5.3.4 Data interpretation

The themes arising from the qualitative data can produce a coherent narrative that can be interpreted alongside the quantitative data. Examined together, there will be an overall picture painted by the quantitative data with rich explanations provided by the themed qualitative data (Creswell & Plano Clark, 2007).
5.3.5 Timetable

A copy of the proposed research timetable can be found in Appendix 2.

5.3.6 Audio and video recordings

Both audio and video recordings will be used during the data collection phase in order to lend credibility to the data itself. It is important that the participants have the opportunity to examine the transcripts resulting from these recordings in order to ensure they accurately represent their thoughts and feelings. Participants will be able to add and amend sections of the transcripts as necessary not only to ensure internal validity but also to protect interpretive validity.

5.4 Sample population and sampling

There will be up to 255 participants selected for recruitment for this research study, these being ELT students of a B2 intermediate level of ability according to the CEFR. They must be studying as part of an ELT course in the UK. All participants will be aged between 18 and 30, this being part of my publishing context's key age group. One potential school has already been identified as a possible recruitment source although this remains to be confirmed.

Ideally, the participants would be recruited from one or two ELT private language schools based in the UK. According to English UK (Student Marketing Ltd., 2015), the average private ELT school within its membership had a student population of 749 as of 2015.
Therefore, to achieve a 95% confidence level and a ± 5% confidence interval, a sample size of 254 participants would be needed (see Appendix 3). Considering there were some 230,599 adult students studying in English UK member schools in 2015 (Student Marketing Ltd., 2015), there is a good opportunity to recruit potential participants both through personal and work ELT contacts.

However, recruiting up to 255 students for this research may prove difficult especially since I work for a publisher without direct access to students. Nevertheless, an initial round of quota sampling with students meeting the above criteria will help start the recruitment process. Students recruited as a result of the quota sampling will form a mid-sized group but can make further recommendations as to other potential recruits. This use of snowball sampling can help further grow the sample with opportunistic sampling also being usefully applied.

5.5 Representation, authenticity and validity

With a relatively small sample size there may be questions as regards the representative nature of a sample of 255 ELT students. This may be an issue in terms of generalising the data to the wider population of ELT students. Although this research will still be able to generate useful insights that can inform ELT publishing, it is felt that it can realistically serve as an initial phase of a larger-scale research undertaking that can work with a larger and more representative sample to produce more generalisable data. As an initial phase, this research can point the way forward for these future larger-scale phases. According to Creswell (2009), this gives rise to validity in terms of catalytic authenticity, the fact that it gives rise to further research, as well as educative authenticity, the provision of new
understandings, in the case of this research, for the ELT publishing industry. As regards catalytic authenticity, this research will necessarily provide a detailed description of the principle issues and supportive qualitative data. This will allow for a determination to be made as to whether the research is comparable and translatable, an important factor since this is to act as an initial phase for further research. Moreover, the fact that a mixed methods design has been employed will, according to Lund (2012) allow for a greater degree of valid inferences and conclusions to be made. Any similarity in results arising from these different methodologies will increase validity. Conversely, any differences can lead to further research through catalytic authenticity.

5.6 Ethical considerations

According to the British Educational Research Association, (2011: 5), voluntary informed consent is a situation whereby, "participants understand and agree to their participation without any duress, prior to the research getting underway." As a result, participants will be informed that the main aim is to collect information to compare ELT activities produced for print, computer and tablet devices. Participants will be completing such activities and they may also be invited to take part in an interview and think aloud task where they talk about their experiences, thoughts and feelings when completing these activities. They will have the right to withdraw from the research at any point. Furthermore, they will be informed that they will be audio and video recorded, all of which they will have the right to examine and edit as necessary.

Since this project will involve me being in a dual role of both ELT publisher and researcher, it is important that the participants not be influenced by either element. As a result, the
wording of the informed consent documentation will need to be as neutral as possible so as to inform but not influence participants. Additionally, to avoid misinterpretation of information provided by participants or any researcher bias, in vivo coding for both the interview and think aloud segments will help ensure it is the participants' voice that is presented rather than the researcher's (Saldaña, 2009). Furthermore, conducting, "reliability checks" (Sugirin, 1999:2) with participants by way of retrospective questioning and having them check recording transcripts will also help preserve intended meaning.

Participants will have the right to confidentiality and anonymity (British Educational Research Association, 2011), not being identified or identifiable in the final research report, this being normal practice according to Corden and Sainsbury (2005). However, with my dual role as publisher and researcher, care will need to be taken to ensure that certain pieces of data do not result in an individual being identifiable (Wiles et al., 2006).

This research is examining the issue of equivalence between paper-based activities and those that may be produced for computer and tablet devices. If these activities are not equivalent, the participants may have been disadvantaged. To mitigate the repercussions of this possibility, this research will be undertaken separately from any course they are currently undertaking. Nevertheless, by identifying a potential disadvantage, this research can attempt to correct or raise awareness of that in ELT publishing thus adding to educative authenticity (Creswell, 2009).
6. **Concluding remarks**

Regardless as to which medium students decide to study in, they should have confidence that they will be able to achieve the same learning outcomes and develop their language skills in the same manner. That is why Noyes and Garland’s (2008) notion of equivalence is so important. One medium is not to be considered superior to another. By considering reading comprehension in both paper and online formats, it is hoped that this study will enable materials developers and publishers to ensure equivalence is achieved or maintained as far as possible. Additionally, by investigating how to include comprehension cues in online activities, a gap in the research, as indicated by (Liu, 2015), will be addressed.
7. References


UK: MIT Press.


RAND Reading Study Group. (2002). *Reading for understanding: Toward a research and development program in reading comprehension*. Santa Monica, CA.


Appendix 1: Examples of Online ELT Activity Templates

Vocabulary drag and drop

Match the pictures to the words.

![Fruits](image)

Kiwi | Banana | Apple | Orange

Listen and multiple choice

Listen to the story and answer the questions.

1. Where did the Jones family go on holiday?
   a. Scotland
   b. England
   c. Wales
   d. Ireland
Listen and gap fill

Listen to the story and complete the sentences.

Lorem ipsum dolor sit ______, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ______ laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat ______ non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

Read and multiple choice

Read the text and answer the questions.

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1. Where did the Jones family go on holiday?
   a. Scotland
   b. England
   c. Wales
   d. Ireland
Read and gap fill

Read the text and complete the sentences.

Lorem ipsum dolor sit ______, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ______ laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat ______ non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.
### Appendix 2: Research Timetable

<table>
<thead>
<tr>
<th>Tasks</th>
<th>Start Date</th>
<th>Due Date</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Literature search and review</td>
<td>1 July 2017</td>
<td>31 January 2018</td>
<td>6 months</td>
</tr>
<tr>
<td>Print and online activity writing and design: RQ1 and RQ2</td>
<td>1 February 2018</td>
<td>31 March 2018</td>
<td>2 months</td>
</tr>
<tr>
<td>Data collection planning, sample recruitment</td>
<td>1 April 2018</td>
<td>30 June 2018</td>
<td>3 months. Extended to the end of December to compensate for the Christmas break</td>
</tr>
<tr>
<td>Data collection RQ1, QUAN</td>
<td>1 July 2018</td>
<td>30 September 2018</td>
<td>3 months</td>
</tr>
<tr>
<td>Data collection RQ2, QUAL Interviews &amp; follow up</td>
<td>1 October 2018</td>
<td>31 October 2018</td>
<td>1 month</td>
</tr>
<tr>
<td>Data collection RQ2, QUAL Think aloud</td>
<td>1 November 2018</td>
<td>30 November 2018</td>
<td>1 month</td>
</tr>
<tr>
<td>Data collection RQ2, QUAL Retrospective questioning</td>
<td>1 December 2018</td>
<td>31 December 2018</td>
<td>1 month, including time off over Christmas</td>
</tr>
<tr>
<td>Data analysis</td>
<td>1 January 2019</td>
<td>20 April 2019</td>
<td>4 months</td>
</tr>
<tr>
<td>Drafting and writing up</td>
<td>1 May 2019</td>
<td>31 October 2019</td>
<td>6 months, including 2 weeks summer holiday</td>
</tr>
<tr>
<td>Submission</td>
<td></td>
<td>December 2020</td>
<td>Submission date stated as December 2020</td>
</tr>
</tbody>
</table>
Appendix 3: Sample Size Calculation

Source: http://extension.psu.edu/evaluation/tipsheets/general/how-to-determine-a-sample-size

\[ n = \frac{P(1-P)}{\left(\frac{A^2}{Z^2}\right) + \left(\frac{P(1-P)}{N}\right)} \]

- \( N \): the number of people in the population
- \( P \): the estimated variance in the population as a decimal
- \( A \): the precision required as a decimal
- \( Z \): the confidence level (1.96 for 95% confidence)

\[ n = 0.5(1-0.5)/\left(0.05^2/1.96^2\right) + (0.5(1-0.5)/749) \]

\[ n = 254 \]