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# 1 Introduction

The aim of this deliverable is to report on the progress of the pilots being carried out in schools across six EU countries: the UK, Greece, Germany, Spain, Sweden and Romania. The chief focus of the pilots are three technologies: the Navigo game, the Amigo Reader and the accompanying teacher tool that allows the teacher to customize the game/Reader. By 'pilot' we refer to the following sets of research activities each with a distinct purpose:

- *Empirical studies under the researcher's supervision* – ***Intervention Phase****:* The aim of these studies is to examine the impact of distinctive app features offered in each app on the children's learning and progression. For the game, we focus on children's attention to and understanding of elaborative feedback referred to as 'Game elaborative feedback study'. In the Reader we examine the impact of the text highlight on reading referred to as 'Reader highlighting study'.

- *In the wild studies facilitated by each research teams* – ***Implementation Phase*****:** The aim of these studies is to understand if and how the iRead technology fits in the ecology of teaching and learning, and what the take up is. The focus is to unpack the facilitators and barriers of technology integration in the school context with a particular emphasis on understanding the complexities of the educational setting. This work is referred to as the 'appropriation study'. Additionally, there is an open pilot that invites parents to download and use the Navigo Game at home.

In addition to these research activities, each pilot lead has had to engage in a series of time demanding practical tasks that support the research. These will be reported to reflect the effort spent in WP9.

# 2 Timeline, tasks and participant numbers

Within the iRead WP9 team we have a diverse set of expertise ranging from partners who are research-oriented (e.g. UCL, UOI, UGOT) to those who are embedded in practice (e.g. Doukas, British Council). Additionally, one of our partners, University of Barcelona, have connected iRead to their PhD programme and in doing so have boosted their capacity and contribution to the project. With this context in mind, certain partners have given more emphasis to the empirical research studies, whereas others have focused on gaining know-how in the practical tasks in order to support the other partners in these tasks.

As coordinator of WP9, UCL has encouraged this approach whilst ensuring we have empirical data for each of the three learner groups in focus: *novice readers, readers with dyslexia and readers learning English as a foreign language (EFL)*. This will be reflected in the empirical study sections 3 and 4. A timeline of the WP9 activities and a detailed account of our tasks appears in Table 2.1 to reflect the effort we have spent so far.

***Table 2.1 – Timeline and Tasks***

| **Timeline** | **Task** | |
|---|---|---|
| *February 2019-present* | Practical tasks supporting research | • Set up storage/charging stations with schools if needed for the tablets<br>• Set up of tablets with apps and privacy settings |

| | | |
|---|---|---|
| | | • Conduct regular app updates for the schools if they require this<br>• Document the serial numbers and archive tablet boxes for the purpose of repairs if needed<br>• Set up of individual user accounts for students and teachers on the iRead system<br>• Gain and digitise parental and child consent/information, also for setting up user accounts<br>• Storage and archiving of research data in accordance with ethics principles<br>• Brokering the school relationship and ensuring the schools benefit from the project and have the support they need |
| *February 2019-December 2019* | Game study tasks | • Arrange with the schools that the children spend time away from the classroom in repeat visits<br>• Administration of tests<br>• Data collection of game play videos in small groups<br>• Video analysis of game play sessions<br>• Consent from parents and children |
| *February 2019-December 2019* | Reader study tasks | • Arrange with the schools that the children spend time away from the classroom in repeat visits<br>• Devising age appropriate texts with the focal features present<br>• Working with the WP8 team to upload texts on the server<br>• Three sessions 1:1 for administration of tests<br>• Data collection in small groups<br>• Data entry and statistical analysis<br>• Consent from parents and children |
| *October 2019-present* | Appropriation study tasks | • Obtaining data from public records and interviews to construct school descriptions<br>• Note keeping of interactions within the schools<br>• Interviewing of teachers and questionnaires<br>• Ongoing inductive analysis of qualitative data and generation of a project wide framework of analysis<br>• Consent from parents and children |

# 3 Focused Evaluations – Intervention Phase: Reader highlighting studies

## 3.1 Rationale for Reader study – novice readers and struggling readers/children with dyslexia

Existing reading schemes in the UK (e.g., Read Write Inc) typically provide a pre-reading activity for each book and focus on drawing the child's attention to specific, targeted grapheme-phoneme correspondences (GPCs) that will be repeated throughout the story book to consolidate learning. For instance, the focus may be on split digraphs, or vowel and consonant alternatives (e.g., the alternative graphemes 'ou', 'ow' that make the same sound). In a similar vein, the development of the Amigo Reader has included a pre-reading teaching instruction as well as a feature to highlight targeted GPCs within the text (see D7.1). Currently there is a lack of evidence examining how this function - highlighting features within a word - aids the reading process for beginner (novice) readers and struggling readers.

It is possible that directing children's attention to GPCs that are the focus of teaching sessions would be beneficial. Learning to read can be challenging for beginner readers as well as children with dyslexia who typically present with phonological difficulties and often struggle to identify and manipulate phonemes within words (Snowling, 2012). Research has shown that e-books that have the function to change the font size, line spacing, and background colour are beneficial to readers with dyslexia (Machan & Alexio, 2016; McCarthy & Swierenga, 2010). Word and sentence highlighting alongside audio (text-to-speech) has also been shown to increase readability for poor readers (Gerbier et al., 2018) and children with a diagnosis of dyslexia (Ikeshita, Yamaguchi, Morioka & Yamazoe, 2018). Further, in a small-scale study, Cramer and colleagues (2016) report that colour-coding spelling and reading rules helps children to learn letter-sound relations (GPCs). This finding of the benefit of providing cues relating to phonology using colour enhancement is also supported by research on children with dyslexia (Fan, Antle, Hoskyn, Neustaedter & Cramer, 2017). It is, therefore, conceivable that focusing attention to features within a word on an e-reader (i.e., making the target feature more salient) will increase recognition and speed of retrieval of the phoneme. Yet, this is still to be explicitly tested.

Existing research has considered the impact of font type on the reading process for children with dyslexia by directly comparing the reading performance of children as they read passages in different fonts (see Kuster, van Weerdenburg, Gompel, & Bosman, 2017; Marinus et al., 2016). Using a similar approach, the present study aimed to investigate the impact of highlighting a specific feature (GPC) on the reading process (namely, accuracy and fluency). The pupil voice was also explored to gain insight on children's perceptions of the highlighting function. Two conditions were proposed: i) where children read texts on the Amigo Reader that did not highlight the target feature, and ii) where children read texts on the Amigo Reader that highlights the target feature. These two conditions were directly compared to address the following research questions:

1. Does highlighting a target feature improve reading accuracy of the lexical items?
2. Does highlighting a target feature improve reading fluency of the overall text?

3. How do children rate their reading performance in the presence vs absence of highlighting, and do they consider the instruction and highlighting to be helpful?

It was hoped that this exploratory study would be the first step before considering running an intervention study using the highlighting function to improve reading accuracy over time. Moreover, the findings may provide a rationale for pre-sets in the Amigo Reader (i.e., whether the pre-reading instruction should always be accompanied with the highlighter function, or not).

Section 3.3 reports the current progress of this study across the partners. The focus of this deliverable will be on reporting the struggling readers (UK, UCL) and children with dyslexia (Greece, UOI) studies; with the novice readers studies (UCL, UB, Doukas) to follow in the final project deliverable. Of note, there were slight variations between the two studies reported here (sections 3.4 and 3.5). The first being that the sample in the English-speaking group were recruited on the basis of being struggling readers, rather than children with dyslexia per se. The reason being that in the UK there has been a shift away from diagnosing dyslexia in primary schools; yet, many children are still recognised as struggling with literacy and will receive additional targeted or specialist support. In contrast, the Greek-speaking sample did have a diagnosis of dyslexia. The samples are detailed in 3.4 and 3.5 respectively. Another variation to note is that the pre-reading instruction was always provided to children in the UK study (UCL team) regardless of whether they saw the highlighting or not; however, in Greece UOI chose not to display the pre-reading instruction. Finally, due to logistics, UOI were unable to explore research question 2 and will report only on research questions 1 and 3.

## 3.2 Rationale for Reader study – EFL learners

In the field of second language acquisition (SLA) research, exposure to comprehensible input is generally considered to be a necessary condition for second language (L2) learning to occur. However, L2 learners usually do not process all the information that is made available in the input (Corder, 1967). Only a subset of the input to which learners are exposed gets processed and then learned, and attention is regarded as a key cognitive process determining what subset of the input gets selected for subsequent processing (Robinson, 2003; Schmidt, 2001). As a result, a principal question in instructed SLA research and practice is how learners' attention can be directed to linguistic features during L2 learning activities.

In the context of reading, researchers have suggested that one way to draw learner attention to language is by the means of textual enhancement. The aim of textual enhancement techniques is to make linguistic features salient in the input (Sharwood Smith, 1991, 1993), and thereby draw learners' attention to linguistics constructions that may otherwise remain unnoticed and thus unlearned (Leow, 1997, 2001; Robinson, 1995; Schmidt, 1990) while keeping learners' primary attention on meaning. Enhancing written input typically involves some kind of textual modification, such as <u>underlining</u>, highlighting, **boldfacing**, *italicization*, CAPITALIZATION, colouring or using different types of fonts (Sharwood Smith, 1991, 1993).

The effectiveness of textual enhancement has been examined in a large number of studies; a meta-analysis of 16 studies (Lee & Huang, 2008) found a small but positive impact of textual enhancement on L2 grammatical development. Most of the existing research, however, has been short-term (Han, Park, & Combs, 2008; Lee & Huang, 2008) and focused on the acquisition of syntax and inflectional morphology by adult populations. Little is known about the longitudinal effects of textual enhancement on L2 development in derivational

morphology by child language learners, despite the fact that morphological knowledge is a reliable predictor of reading skills (Geva & Ramirez, 2015), and most second language instruction targets children.

Against this background, the aim of this study is to investigate the extent to which highlighting can facilitate development in the knowledge of L2 derivational morphology by child language learners. To address a key methodological limitation of previous research, the study involves a 6-week longitudinal treatment rather than a single treatment session. Another methodological strength of the study is that it is conducted in four English as a foreign language settings with learners from different first language (L1) backgrounds (Greek, Romanian, Spanish, and Swedish), allowing for testing the generalisability of any effects of highlighting across typologicaly different L1 groups.

The highlighting function of the Amigo Reader is the focus of this research with the target morphemes highlighted in yellow. The research question of the study is:

- *To what extent does textual enhancement in the form of highlighting lead to development in the knowledge of L2 derivational morphology?*

## 3.3 Partner progress on Reader Studies

Before reporting our findings, the table below summarises partners' progress across the two Reader studies. We also note what data is reported in this deliverable.

| | Data Collection | Analysis | Deliverable report |
|---|---|---|---|
| **English as a foreign language** | | | |
| Sweden (UGOT) | *Completed* | *Ongoing* | *Part of the data to be reported in Dec 2019 Section 3.6* |
| Greek (BC) | *Completed* | *Ongoing* | *December 2020* |
| Romanian (ULBS) | *Completed* | *Ongoing* | *December 2020* |
| Spanish (UB) | *Completed* | *Ongoing* | *Part of the data to be reported in Dec 2019 Section 3.6* |
| ***Novice Readers*** | | | |
| English (UCL) | *In progress* | | *December 2020* |
| Spanish (UB) | *Completed* | *Ongoing* | *December 2020* |
| ***Dyslexia/Struggling readers*** | | | |
| English (UCL) | *Completed* | *Completed* | *December 2019 Section 3.4* |
| Greek (UOI) | *Completed* | *Completed* | *December 2019 Section 3.5* |

## 3.4 Readers with Dyslexia/Struggling to Read – English (UCL)

### 3.4.1 Methodology

***Participants***

Thirty-four children across Years 4-6 (Key Stage 2; age range, 8-11 years) were initially recruited from primary schools in London. Children were identified for the study by the schools' Special Educational Needs Co-ordinator (SENCo) on the basis that they were known to present with literacy difficulties and were receiving targeted (small group) support for reading. Parents/carers gave written consent for their child to participate in the study. Three children were excluded from the analysis due to being absent for the final testing session. Therefore, the final sample comprised 31 children classed as struggling readers (24 male, 7 female; mean age: 9 years, 7 months).

## *Measures*

*Background measures*

The following background measures were conducted to further profile the group:

Single-word reading ability was assessed using the British Ability Scales, third edition (BAS-3; Elliott, 2011), which has UK norms. Here, children were asked to read a series of words aloud that increased in difficulty as they worked through the list. Raw scores (i.e., the number of words ready correctly) were converted to standard scores (*M* 100, *SD* 15). Typically, scores below 1SD (< 85) have been used as a proxy for a reading difficulty.

Reading fluency was assessed using a paper-based passage task, the Florida Assessment for Instructions in Reading – Oral Reading Fluency (ORF; Florida Centre for Reading Research, 2009). Children read a text containing 287 words which was matched in length and difficulty to the experimental reading texts discussed below. Total time spent reading and any errors made were recorded. The number of correct words read per minute was calculated. Results could then be compared to the test percentiles.

A bespoke screening of the target features described in the following section relating to the experimental texts was conducted to determine children's knowledge of the selected features outside of a passage reading task (where no context could be used). Children were asked to read 18 pseudowords containing the target vowel features (/ei/ for <ay>, <ai> and <a> ; /ai/ for <igh>, <y> and <ie>). Two scores were given: one for the target and one for overall word accuracy. The target accuracy will be used in the results.

*Reading task*

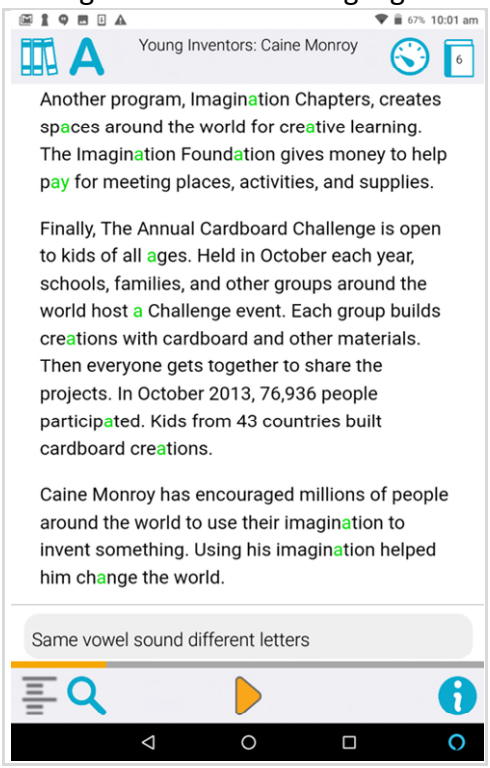
Following discussions with primary school teachers, two grapheme-to-phoneme correspondences (features) were identified as the focus of the reading task. It was suggested that struggling readers often have difficulty with reading the <igh> digraph (vowel sound /ai/) and <ay> digraph (vowel sound /ie/), as they are less frequent. Given that the Amigo Reader has pre-reading instructions which compare across different graphemes with the same sounds to try and help children to decode the less frequent digraph using knowledge from the other two examples, three variations of digraphs forming the /ai/ and /ie/ sounds were used (specifically: <igh>, <y> and <ie> for /ai/; and <ay>, <ai> and <a> for /ie/). Using these digraphs (hereon referred to as 'features'), 4 original texts were constructed (2 parallel texts per feature).

Each text contained twenty words with the target features. The twenty words varied in syllabic structure, length, position of the feature within the word and frequency; but, importantly, were matched in these characteristics across the two parallel texts. Both the

Children's printed word database (Masterson, Stuart, Dixon, & Lovejoy, 2010) and the iRead dictionary database were used to identify suitable words and to match these characteristics. The overall texts were also closely matched for length (in number of words) and level of difficulty. The Lexile Framework for Reading was used for this purpose (incorporating data on mean sentence length, mean word frequency and text length). The aim was to write texts that were readable, understandable and entertaining for Key Stage 2 struggling readers. Therefore, we wrote short stories with a simple storyline, in short sentences, with a range of simple and more challenging vocabulary, aiming for a Lexile measure within the 400-500L range. All final texts were found to be within this range. Texts were piloted for readability with two children separate from the research study.

All four texts were added to the server in order to be accessed by Amigo and the highlight function was checked to ensure that the reader was correctly identifying the target features. The 'highlight' meant that the target features were shown in green text (see Figure 3.1). A pre-reading instruction was provided on the tablet for each text. This showed the corresponding three target features visually and emphasised that they were the same sound, although different graphemes. Children then entered the designed text and were asked to read each one aloud. A running record was taken by the researcher. The audio was also recorded so that the researcher could check errors later. The researchers noted the number of reading errors made, the type of errors, and the overall time taken to read the passage. Each text was then scored in five ways: i) accuracy of the target feature, ii) accuracy of the word containing the feature, iii) overall text reading accuracy, iv) total reading time (fluency), and v) correct words read per minute (fluency).

Figure 3.1 – Reader Highlight




*Questions relating to reading performance*

A series of questions were asked to the children after taking part in the reading task. Children were asked how well they thought they read after each text so that comparisons could be

made between the highlight and no-highlight condition. Following reading the highlighted texts, children were also asked about how helpful it was to practise the sounds first (relating to the pre-reading instruction); and how helpful the highlighting in the story was perceived to be. Children responded to the questions by pointing to one of an array of five smiley faces. Responses were then scored between 1-5 (1 being not at all helpful, 5 being very helpful).

### *Procedure*

Children were tested individually in their school across three short sessions. The first session comprised the background measures, the second session involved reading two of the texts on the Amigo Reader (one per feature) in the no-highlight condition, and the final session involved reading the final text texts in the highlight condition. It was originally planned that the order of the two conditions (highlight vs. no-highlight) would be counterbalanced. However, due to some technical difficulties with the highlight function and the need to start data collection before the school break, children had to first read the texts in the no-highlight condition and the final session comprised the highlight condition texts. This will be picked up later in the discussion. However, of note, the texts in which the highlighting did appear was counterbalanced across participants (e.g., half of the group read Text 1 with the <igh> feature highlighted, while the other half read Text 2 with the <igh> feature highlighted; and the same applied for <ay>).

Children were told they were to practice their reading skills on the tablet with a special app. The app would give them a useful tip for their reading (i.e., the pre-reading instruction), and they would then practice that tip in a short text containing the vowel sound from the tip. On completion of the reading tasks, children were asked to rate their reading experience.

### *Data analysis*

Quantitative data were analysed using SPSS. Descriptive data (group means and standard deviations [SDs]) are presented for the background measures and the results answering research questions (RQ) 1 and 2. Paired samples t-tests were used to compare reading accuracy and fluency (RQ1, RQ2) across the two conditions (highlight vs. no-highlight), for both features. The findings for RQ3 are presented descriptively.

## Findings

The results from the background measures are presented in Table 3.4.1. Of note, although all children were identified as struggling readers by the school SENCo, a number of children performed within the average range on the single word reading accuracy measure (BAS-3). For this measure, Table 1 demonstrates that the group mean was 88.64. In fact, only 11 children (35%) scored <1SD below the test mean. The whole group will be considered in subsequent analyses because they were identified by school staff as being behind their peers in reading. However, the subset of 11 children will also be considered separately to determine whether these children with more significant reading difficulties performed differently from the group as a whole.

**Table 3.4.1.** Group Means (and SDs) for the Background Measures

| | **Struggling readers;** *n* = 31<br>Means (SD) |
|---|---|
| Single word reading accuracy (BAS-3) | 88.54 (10.96) |
| Reading fluency (ORF), correct words per min | 96.29 (25.35) |
| 'IGH' feature accuracy, % | 60.57 (25.47) |

| | |
|---|---|
| 'AI' feature accuracy, % | 65.23 (27.18) |
| *Note.* BAS-3 standard score, *M* 100, *SD* 15. | |

For the reading fluency measure, the correct words per minute value is presented in Table 1 for ease of reporting and comparison to the reading rates for RQ2 below. A comment also can be made here that ORF age percentiles were considered. Eight children (26%) were found to be performing below the 10th percentile which demonstrates a significant fluency difficulty. Eleven children (35%) performed between the 10th-25th percentile; 7 children (23%) between the 25th-50th percentile; and the remaining 5 children (16%) between 50th-75th percentile.

Finally, for the background measures, the percentage of accurate responses on the pseudoword screening task demonstrate that children made errors on both features. However, again of note, there were 7 children that read the 'ay' feature with 100% accuracy and 3 children that were able to read the 'igh' feature with 100% accuracy in this pre-test. Yet, on the whole children appeared to have difficulty with reading the two selected features. As above, all children were included in the subsequent analysis to ensure power for the statistics presented. However, those that scored at 100% accuracy in the screening test were excluded in a separate analysis to determine whether the pattern of results changed at all. This is clarified in the relevant sections below.

The remaining results will now be discussed in relation to the three research questions.

*RQ1: Does highlighting a target feature improve reading accuracy of the lexical items?*

Table 3.4.2 presents the mean percentages of correct responses across the two conditions (highlight vs. no-highlight) for both features. A series of paired samples t-tests were conducted on the group accuracy scores. For the <igh> feature, the analyses revealed no significant difference in performance in the two conditions on target feature accuracy, $t(30) = .36$, $p = .71$, target word accuracy, $t(30) = .52$, $p = .61$, and the overall accuracy of reading the complete text, $t(30) = -1.30$, $p = .20$.

Similarly, for the <ai> feature, the analyses revealed no significant differences across the two conditions for target feature accuracy, $t(30) = -.49$, $p = .63$, target word accuracy, $t(30) = -1.05$, $p = .29$, and overall accuracy, $t(30) = -.94$, $p = .36$.

**Table 3.4.2.** Means (SD) for Reading Accuracy for the Two Conditions

| | **No-highlight** *n* = 31 Means (SD) | **Highlight** *n* = 31 Means (SD) |
|---|---|---|
| **Feature <igh>** | | |
| Target feature accuracy, % | 90.48 (13.68) | 91.12 (16.56) |
| Target word accuracy, % | 83.39 (16.95) | 84.35 (21.78) |
| Overall text accuracy, % | 93.62 (10.95) | 92.24 (12.84) |
| **Feature <ai>** | | |
| Target feature accuracy, % | 91.13 (15.53) | 90.49 (14.91) |
| Target word accuracy, % | 87.25 (17.93) | 85.64 (21.52) |
| Overall text accuracy, % | 94.22 (7.67) | 92.99 (12.76) |

Two types of further analyses were conducted on the measures above. The first excluding children that scored >85 on the BAS-3 single word reading background measure; the second excluding those that had 100% accuracy on the pseudoword screener. These analyses did not yield different results to those reported above – no differences were found for accuracy in the two reading conditions. The results are not reported here for brevity.

*RQ2: Does highlighting a target feature improve reading fluency of the overall text?*

Reading fluency was considered in two ways: total time taken to read the texts and the correct words read per minute. The means scores for each condition are shown in Table 3.4.3. An observation can be made that, in comparison to the ORF background measure, children read fewer words per minute in these experimental reading tasks (means ranging between 76.48-78.40 words, compared to a mean of 96.29 in the paper-based ORF).

**Table 3.4.3.** Means (SD) for Reading Fluency for the Two Conditions

| | **No-highlight** *n* = 31 Means (SD) | **Highlight** *n* = 31 Means (SD) |
|---|---|---|
| **Feature <igh>** | | |
| Total time (secs) | 164.32 (75.08) | 168.81 (70.86) |
| Correct words per minute | 78.40 (28.41) | 76.48 (32.14) |
| **Feature <ai>** | | |
| Total time (secs) | 164.35 (79.26) | 163.23 (75.15) |
| Correct words per minute | 76.77 (29.23) | 76.70 (28.98) |

*Note*. secs = seconds

Paired samples t-tests revealed no group differences between the texts read with the highlight present or absent for the total time taken, <igh> feature, $t(30) = -.67$, $p = .51$, and <ai> feature, $t(30) = -.20$, $p = .84$; nor for the number of correct words read per minute, <igh> feature, $t(30) = -.58$, $p = .57$, and <ai> feature, $t(30) = -.03$, $p = .97$.

Following the same approach as RQ1, the two additional analyses excluding children with age-appropriate reading levels on the background measures were conducted. Once more, the pattern of results was as shown above.

*RQ3: How do children rate their reading performance in the presence vs absence of highlighting, and do they consider the instruction and highlighting to be helpful?*

In the presence of the highlighting, the mean score rating for how well children felt they read the text was 4.12 (note, 5 being the highest score possible). Twenty-two children (71%) felt that they read these texts well (score of 4) and very well (score of 5). The results can be compared to their ratings after reading the texts without the highlighting enabled. The mean score rating for how well children felt they read the text without the highlighting was lower at 3.79.

When asked if they found the pre-reading instruction and the highlighting of features helpful, the responses demonstrated a mean score of 4.32 for the pre-reading instruction and 4.09 for highlighting (note, 5 being the highest rating - very helpful). Only one child scored the pre-reading instruction as '1 – not at all helpful', with the majority scoring this as a 4 or 5 (25 children, 81%). For highlighting, three children did not find it at all helpful (scoring it 1); yet, 23 children (74%) scored this function as a 4 or 5 (suggesting it was in fact very helpful).

### 3.4.2 Summary and Discussion

The present study aimed to examine whether reading accuracy and text fluency differed in relation to the presence or absence of the highlighting of specific features (GPCs). Two features were chosen as the focus of this study based on teacher input. The initial screener confirmed that these features were challenging for English-speaking struggling readers in Key Stage 2.

The findings for both research question one and two consistently revealed that there were no significant differences in how accurate and fluently the texts were read in each condition on the Amigo Reader. Thus, the highlighting of target features did not result in better reading performance. These findings were surprising given that existing research has been able to demonstrate an advantage of colour coding for learning reading rules (Cramer et al., 2016; Fan et al., 2017). However, the referenced work used small samples and focused on single word reading, rather than the reading of a complete passage as in the present study. One possible explanation for the accuracy and fluency findings could be that the colour of the highlight (green) was not salient enough. Future work could consider making the highlighting stand out more, perhaps by using a bolder colour or highlighting both the text and background. Within the project, this finding informed a different approach for the EFL Reader highlight study (section 3.7), which instead employed a highlighted yellow background in place of the green text highlight.

The final research question considered children's perceptions of the highlighting function on the Amigo Reader. Although this data is just exploratory, it is interesting to note that, on the whole, the pre-reading instruction and highlighting function was considered to be helpful. Future work could consider whether those that rated these functions highly were also performing better in the accuracy and fluency measures.

Limitations of the study can be acknowledged. It was initially planned that the two conditions would be counterbalanced. However, due to technical difficulties this was not possible and the no-highlight condition had to be presented first followed by the highlight condition. Nevertheless, we do not believe that the results were impacted by order effects. Reading speed was in fact quicker and reading accuracy was higher for the <ai> feature in the no-highlight condition which would not be expected if there were order effects. Another recognised limitation is that the selected children did not all have an existing diagnosis of dyslexia and were recruited based on teacher referral. Further, linked to this, many children reached ceiling for the accuracy measures in the experimental reading tasks. The ceiling effect was a surprise given their performance in the pseudoword screener which tested knowledge of the two features. It is, of course, possible that children were able to use the context of the sentence to decode the word. Future research may wish to compare the reading of single words with the highlighted feature (where context cannot be relied upon) versus passage reading.

In sum, highlighting target features within a text to further enhance the pre-reading instruction did not appear to improve reading performance (accuracy and fluency) for English-speaking struggling readers.

## 3.5 Readers with Dyslexia/Struggling to Read – Greek (UOI)

### 3.5.1 Methodology

#### *Participants*

Thirty children (8 girls) in Years 4 and 5 (aged 8-10) participated in this study. Children were recruited from six different public schools in Ioannina, Greece. All children were identified as struggling readers by the special needs coordinator of their school. Children with reading difficulties were selected for inclusion according to the clinical diagnosis of a certified speech and language pathologist, following detailed language and neuropsychological testing (by using Raven's Colored Progressive Matrices (CPM; Raven et al., 1998) and DVIQ test for school-aged students (Stavrakaki & Tsimpli, 2000). All participants were assessed on a subset of verbal tasks (part of a large neuropsychological assessment tool; Economou et al., in progress) prior to testing, including a digit span (WAIS-III (Wechsler, 1997), which involved repetition of sequence of numbers), a memory span task (involving repetition of sequence of words), a sentence repetition task (in which length and complexity of the presented sentences were manipulated), and a non-word repetition task (with increasing number of syllables). At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Data from 21 children in the sample have been analysed to data and will be reported here.

#### *Measures*

*Reading task*

Four complex linguistic features were selected from the category of "phonology", feature id (345) "irregular: "u" as consonant: ευ:/ev/", feature id (346) "irregular: "u" as consonant: ευ:/ef/", feature id (347) "irregular: "u" as consonant: αυ:/av/", and feature id (348) "irregular: "u" as consonant: αυ:/af/" with irregular grapheme to phoneme correspondence. Features (345) and (346) were paired together, as well as feature 347 and 348, since they both contain the same graphemic representation although they differ with respect to their phonemic correspondence (e.g., μαζεύω /maz**ev**o/ - ευχή /**ef**hi/.

These features were identified in consultation with teachers to be relevant to the children's learning profiles. This was also verified through an initial paper-based pre-test that established that children made errors on the selected features while reading. Specifically, children were assessed on their reading abilities by using Zakopoulou et al.'s (in progress) screening task, which included oral reading of sentences, words and pseudo-words. In order to test children's abilities with those particular features used in the reader study, we created sets of pseudo-words with those features which were integrated within Zakopoulou's test.

For each feature we created 2 original texts (thus 8 texts in total). Each text contained 10 words containing the target feature and ten distractors (containing the paired feature, which had the same graphemic representation although they differ with respect to their phonemic correspondence). Target words were selected from the available dictionary (see D4.1) that feeds both the games and the reader. Target words and distractors were all matched on length (number of characters), number of syllables, within word feature appearance (initial/middle position), frequency, and word category (e.g., verb, noun, adjective). All texts created were closely matched on length; all contained no more than 200 words. Texts were

loaded on to the Amigo reader and the highlighting function was checked to ensure that the features were correctly identified in the text.

Children were asked to read the texts aloud. Texts were presented in a counterbalanced order, half of the texts (4) were presented with the target features highlighted, whereas the other texts were presented without any highlight. Texts were presented in a random pre-specified order. Each child was audio-recorded using an audio recording software installed on the tablet used. Subsequently, all recordings were transcribed and coded for accuracy.
Each text was scored in two ways: i) accuracy of the target feature, and ii) type of error.

*Questions relating to reading performance*
After the completion of the reading tasks on the Amigo reader, children were informally asked whether the use of highlight was helpful (in response to the pronunciation of the target features).

### *Procedure*

All children were familiar with the reader's mechanics since they had used it in a previous stage of the research, thus usability issues could not have influenced the results of the present study. The researcher introduced the texts to each child explaining that they will be presented with some short stories that they need to carefully read in order to understand them. To ensure that children would pay attention to the highlighting feature within words, the researcher explicitly mentioned that sometimes the first syllable of complex words (target feature) appear in colour to help them. Children were free to change the settings of text presentation (increasing or decreasing font size, changing the background colour etc.). Children were not corrected by the researcher in case of an error.

With respect to scoring, phonological errors (e.g., [aftici] instead of /aftaci/) were not taken into account if the contained feature (e.g., 'af' in the example) was preserved. However, target feature omission, mispronunciation or omission of the target word, and production of a different lemma other than the target (e.g., /aftocinitaci/ instead of /aftaci/) were counted as errors.

### *Data analysis*

Quantitative data were analysed using SPSS. Descriptive data (individual data and group means) are reported for the results related to RQ1. Paired samples t-tests were used to compare reading accuracy across the two conditions (highlight vs. no-highlight), across features. The findings for RQ3 are presented descriptively.

## Findings

The results from the background language and non-verbal (Raven's matrices) measures are presented in Table 3.5.1, per participant and depicting the overall mean.

**Table 3.5.1.** Percentage correct scores on DVIQ and Raven tests across participants.

| Inflectional morphology | Derivational | Syntax | Metalinguistic concepts | Sentence comprehension | Comprehension | Sentence repetition | Reading comprehension | RAVEN (CPM) |
|---|---|---|---|---|---|---|---|---|

| | | morphology | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 83,3 | 61,1 | 70 | 80 | 52,2 | 40 | 20 | 90 | 62,9 |
| 2 | 75 | 66,7 | 55 | 73,3 | 91,3 | 70 | 100 | 90 | 54,3 |
| 3 | 66,7 | 88,9 | 60 | 73,3 | 56,5 | 80 | 93,3 | 80 | 82,9 |
| 4 | 83,3 | 77,8 | 25 | 80 | 56,5 | 50 | 86,7 | 80 | 48,6 |
| 5 | 25 | 66,7 | 35 | 66,7 | 78,3 | 60 | 76,7 | 80 | 40 |
| 6 | 41,7 | 88,9 | 80 | 73,3 | 60,9 | 60 | 90 | 60 | 42,9 |
| 8 | 91,7 | 72,2 | 60 | 86,7 | 69,6 | 70 | 90 | 100 | 25,7 |
| 9 | 25 | 66,7 | 65 | 73,3 | 69,6 | 80 | 70 | 70 | 54,3 |
| 10 | 91,7 | 61,1 | 65 | 93,3 | 69,6 | 60 | 96,7 | 80 | 71,4 |
| 11 | 58,3 | 55,6 | 60 | 86,7 | 56,5 | 70 | 90 | 100 | 68,6 |
| 12 | 91,7 | 83,3 | 60 | 93,3 | 87 | 60 | 73,3 | 100 | 51,4 |
| 13 | 91,7 | 83,3 | 60 | 80 | 82,6 | 70 | 96,7 | 70 | 60 |
| 14 | 83,3 | 61,1 | 45 | 80 | 60,9 | 60 | 96,7 | 80 | 65,7 |
| 15 | 91,7 | 72,2 | 80 | 73,3 | 47,8 | 60 | 83,3 | 90 | 65,7 |
| 16 | 41,7 | 61,1 | 65 | 93,3 | 73,9 | 80 | 90 | 100 | 51,4 |
| 17 | 100 | 44,4 | 50 | 66,7 | 69,6 | 70 | 93,3 | 80 | 68,6 |
| 18 | 25 | 22,2 | 45 | 66,7 | 47,8 | 50 | 53,3 | 70 | 57,1 |
| 19 | 100 | 77,8 | 40 | 80 | 82,6 | 30 | 76,7 | 60 | 57,1 |
| 20 | 25 | 44,4 | 40 | 73,3 | 65,2 | 60 | 6,7 | 50 | 42,9 |
| 21 | 33,3 | 55,6 | 35 | 86,7 | 60,9 | 70 | 93,3 | 60 | 62,9 |
| **Mean** | **66,3** | **65,6** | **54,8** | **79** | **67** | **62,5** | **78,8** | **79,5** | **56,7** |

Table 3.5.2 also presents the scores from the background reading screening measure which incorporated the features that were to be tested in the experimental reading task on the Amigo reader.

**Table 3.5.2.** Percentage correct scores on reading words, pseudo-words and sentences.

| Participants | Words % | Pseudo-words% | Sentences% |
|---|---|---|---|
| 1 | 28,5 | 39,2 | 16,7 |
| 2 | 41 | 50 | 0 |
| 3 | 26,7 | 28,5 | 33,3 |
| 4 | 32,1 | 53,5 | 33,3 |
| 5 | 12,5 | 25 | 16,7 |
| 6 | 57,1 | 53,5 | 33,3 |
| 7 | 58,9 | 35,7 | 16,7 |
| 8 | 69,6 | 50 | 16,7 |
| 9 | 33,9 | 35,7 | 0 |
| 10 | 69,6 | 32,1 | 66,7 |
| 11 | 82,1 | 53,5 | 66,7 |
| 12 | 73,2 | 53,5 | 100 |
| 13 | 89,2 | 71,4 | 66,7 |
| 14 | 89,2 | 92,8 | 100 |
| 15 | 98,2 | 100 | 83,3 |
| 16 | 92,8 | 85,7 | 100 |
| 17 | 91 | 85,7 | 83,3 |
| 18 | 87,5 | 85,7 | 83,3 |
| 19 | 96,4 | 85,7 | 83,3 |
| 20 | 83,9 | 89,2 | 50 |
| 21 | 96,4 | 78,5 | 50 |
| Mean | **67,1** | **61,2** | **52,4** |

*RQ1: Does highlighting a target feature improve reading accuracy of the lexical items?*

Accuracy rates for each feature and the mean percentages of correct responses were calculated. Accuracy scores for texts presented with or without highlight were measured separately.

Overall, children performed relatively well. For feature (345) /ev/, children scored 89.5% correct on the target words with 376 correct responses out of 420 when combining highlight/no highlight conditions. For feature (346) /ef/, children scored 93.3% correct on the target words with 392 correct responses out of 420. Similarly, high accuracy scores were obtained for features (347) and (348) /av/ /af/, 90.2% and 89.8% respectively. Subsequently, we analysed accuracy scores in target words when texts were presented with or without highlight (see Table 3.5.3). Similar results were obtained, namely participants performed high across conditions, irrespective of the highlight. No differences were yielded in children's performance when comparing feature (345) with vs. without highlight ($t(418)=$, $p = .525$). Similarly, no differences were attested in the other conditions (for feature (346) ($t(418) = -.521$, $p = .603$), for feature (347) ($t(439) = 1.233$, $p = .218$), and for feature (348) ($t(439) = -.359$, $p = .720$).

**Table 3.5.3**. Mean percentage correct per feature type.

| | Without highlight | With highlight |
|---|---|---|
| **Target /ev/** | 90,4 | 88,5 |
| **Target /ef/** | 92,7 | 94 |
| **Target /av/** | 91,9 | 88,4 |
| **Target /af/** | 89,2 | 90,3 |

An error analysis revealed that, both in the highlight condition as much as the non-highlight, the majority of the errors were related to feature omission or different lemma production.

*RQ3: How do children rate their reading performance in the presence vs absence of highlighting, and do they consider the highlighting to be helpful?*

It is important to note that children were explicitly asked whether they found the highlighting feature useful after the completion of the study. Although some of the students reported finding it useful, the majority did not always notice the highlighting within text. This may be why we do not see any effects in our results.

### 3.5.2 Summary and Discussion

Our findings show that the presence of highlighting during reading texts on the Amigo e-reader did not really affect children's performance. This is contra to our finding that Greek struggling readers focused more on visual cues instead of verbal ones in the game study (reported in section 4). It is interesting to note that few children were able to notice the highlighting function. Thus, we believe that if the highlight was more pronounced it might have played a more significant role to children's reading accuracy.

## 3.6 Conclusions from the Greek and English children struggling to read/dyslexia studies

To conclude, the two studies reported here demonstrate consistent findings. For both English-speaking struggling readers and Greek-speaking children with dyslexia, the use of the highlighting function did not translate to better reading accuracy. Furthermore, for the struggling readers group in the UK, reading fluency was not found to be any different when children read highlighted texts. A possible explanation for the non-significant findings reported here may be that the highlighting was not salient enough. This is captured in the feedback from children with dyslexia in the Greek study. To further explore this, the English-speaking novice reader study, which will commence in the coming months, will use the approach to block highlighting the font and background in a bolder colour (as shown in the following section, 3.7).

Although the comparison of reading performance with/without the highlighting function did not yield significant results, the self-reports from the children provide some additional information. On the whole, English-speaking struggling readers (81%) found the pre-reading instruction, which provided an opportunity to practice the features, to be helpful. Similarly, the majority of struggling readers (74%) reported that the highlighting of the feature coupled with the pre-reading instruction was helpful. In comparison, Greek-speaking children with dyslexia were less likely to notice the highlighting, raising important considerations for the saliency of the features as discussed above.

## 3.7 EFL Readers – Swedish L1 (UGOT) and Spain L1 (UB)

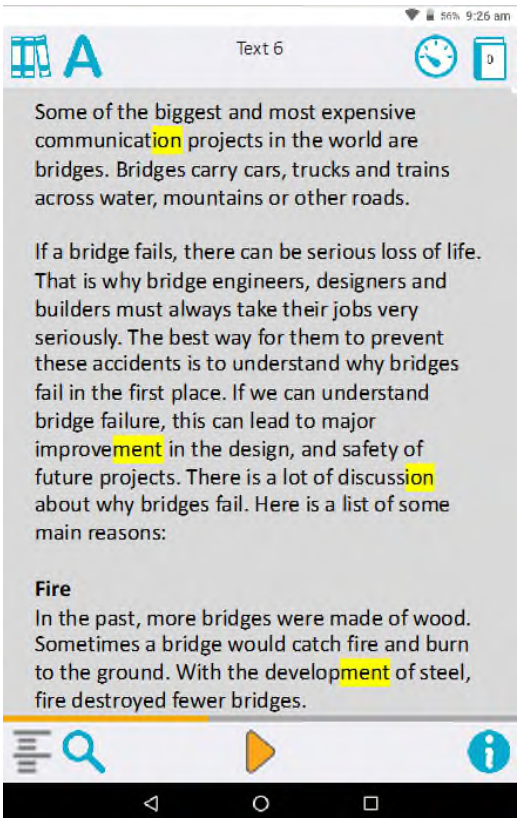
### 3.7.1 Methodology

The study employs a pretest-posttest longitudinal design with six treatment sessions between the pretest and posttest. The participants are randomly assigned to two groups in all four contexts (Greece, Spain, Spain, Sweden): an experimental group and a control group. During the treatment, the experimental groups read texts with the target morphological constructions highlighted (+highlight groups), whereas the control groups read texts without highlighting (-highlight groups).

#### Participants

We plan to include 60 learners in the study from all four contexts (240 learners altogether). They will all be at approximately level A2 according to the Common European Framework of Reference (CEFR), as measured by the Cambridge Preliminary English Test (PET). So far we have collected and analysed data from 30 Swedish learners and 77 Spanish learners. From this pool, we have included 28 Swedish learners (experimental: N=16; control: N=12) and 61 Spanish learners (experimental: N=28; control: N=33) in our preliminary dataset. We excluded participants who missed any of the treatment or testing sessions and/or achieved higher than 60% of the total score on all three pre-tests.

**Figure 3.2.** The highlighting function of Amigo Reader




## Instruments

*Treatment texts*

During each treatment session, participants read one text. That is, altogether they are exposed to six texts during the treatment. In each text, approximately 95% of the words are within the 2000 most frequently used words (K2 words) according to the BNC-Coca corpus, calculated by the means of the program Lextutor (https://www.lextutor.ca/vp/comp/). This makes it likely that CEFR A2 participants achieve an acceptable level of comprehension of the texts (Milton, 2010; Laufer & Ravenhorst-Kalovski, 2010), and thereby have attentional capacity available to notice (Schmidt, 1990, 2001) the targeted morphological forms. The texts ranged from 217 to 267 words in length. All texts used in the experiment are included in Appendix A.

*Linguistic target*

The target morphological constructions are the noun derivational suffixes *–ment* and *–ion*. These suffixes were selected as they naturally occurred in the texts with high frequency. Nevertheless, the texts had to be slightly manipulated to ensure that the target morphemes occur the same number of times in each. In the final texts, each morpheme occurs four times, thus participants are exposed to 24 instances of each derivational suffix across the six treatment sessions. Except for four words, all words including the target suffixes are within the 1000 most frequently used words in the English language (K1 words) using the BBC-Coca corpus as a reference (see Table 3.7.1 for the list of target words). The remaining four words (*direction*, *improvement*, *instruction*, *population*) were K2 words, which are likely to be familiar to the participants as confirmed by their teachers. The words including the target morphemes occur 1-4 times in the texts. It was ensured that no other words in the texts contain word-final letter sequences identical to the target noun derivational suffixes (e.g.,

*comment*, *lion*). For the +highlight group, the target morphemes are highlighted in yellow in the texts.

**Table 3.7.1.** Words with the target construction.

| Text 1 | Text 2 | Text 3 | Text 4 | Text 5 | Text 6 |
|---|---|---|---|---|---|
| Accommodation | Attraction | Attraction | Communication | Attraction | Communication |
| Location | Communication | Discussion | Discussion | Connection | Connection |
| Pollution | Connection | Exhibition | Instruction | Direction | Discussion |
| Population | Education | Location | Location | Education | Location |
| Development | Argument | Advertisement | Development | Development | Development |
| Entertainment | Entertainment | Argument | Equipment | Employment | Employment |
| Excitement | Government | Entertainment | Government | Entertainment | Improvement |
| Movement | Movement | Excitement | Movement | Excitement | Movement |

## Assessments

*Proficiency test*

In all four contexts, participants are administered the reading section of the Cambridge Preliminary Test to determine their reading proficiency. This test includes 35 questions, each question worth 1 point.

*Pretest-posttest measures*

The pretest and posttest comprise equivalent versions of three written morphological tasks adapted from first language research (e.g., Carlisle, 2000; Spencer et al., 2015): a real-world derivational suffix choice task, a non-word derivational suffix choice task, and a non-word derivational suffix decomposition task. All three tests assess participants' receptive knowledge of the target derivational morphemes. We have decided to employ receptive tests given that the participants also receive a treatment focusing on a receptive skill. Two versions were developed for each task, which are administered to participants in a counterbalanced order across the two testing sessions. All tests are included in the Appendix.

The aim of the real-word derivational suffix choice task is to test participants' receptive knowledge of the grammatical information indicated by the suffix. Participants are required to select a correct response from four derivationally related options to complete a sentence, as illustrated below:

We can learn from the older _____.

a. generation b. generative c. generate d. generational

There are 12 items in each version of the test, of which 3 test the knowledge of the *–ion* and 3 items assess the knowledge of the *–ment* morpheme. Thus, the maximum score was 3 points for both the *–ion* and *–ment* morphemes. The rest are distractors. We included a relatively large proportion of distractors to make sure that participants do not identify the target morphemes at the time of the pretest. None of the target words in the tests appear in the treatment texts. Based on the preliminary dataset, Cronbach alpha for the overall test were .73 and .80 for versions A and B respectively.

The non-word derivational suffix choice task intends to assess participants' receptive knowledge of the grammatical information conveyed by the suffix separate from their semantic content. The only difference between this and the real-word derivational suffix task is that this test includes non-words, as shown below:

They had a nice _____.

a. tweaged b. tweagish c. tweagable d. tweagment

The structure of the test and the scoring procedure are the same as for the real-word derivational suffix choice task. The preliminary dataset yielded a Cronbach alpha value of .75 and .72 for versions A and B of the test respectively.

Finally, the aim of the non-word derivational suffix decomposition task is to evaluate participants' awareness of morphological structure, in particular, the relationships between base and derived forms. This task asks participants to decompose derived non-words to complete sentences, as the example below demonstrates.

bancement She is teaching them to _____.

The test includes 12 items, 6 items testing the knowledge of the target morphemes (3 items each) and 6 items serving as distractors. Participants receive one point for each correct response, resulting in a maximum score of 3 points for each morpheme. Based on the preliminary dataset, we obtained Cronbach alpha values of .79 and .72 for versions A and B of the test.

*Comprehension tests*

After reading each text, participants are also asked to answer six comprehension questions to ensure that they process the texts for meaning. Also, the comprehensions questions make it possible to assess whether textual enhancement affects text comprehension.

## Procedure

The study spans approximately 9 weeks. First, participants are administered the proficiency test. Then, the students with appropriate level of proficiency complete the pretest, including the three assessment tasks. Next, the 6 treatment sessions follow. The treatment sessions take place once a week and last about 30 minutes. During each treatment session, participants read one text in their respective conditions using the Amigo reader, each text being followed by comprehension questions. The comprehension questions are administered in pen and paper format. Once the last treatment session is completed, participants complete the posttest.

## Analysis

In the preliminary analyses, the results of which we report here, we carried out all analyses separately for the two contexts (Spain and Sweden). Our rationale for conducting the analyses separately for the Swedish and Spanish datasets was that there were considerable differences in the text comprehension level of the two first language groups, making the validity of any direct comparisons questionable.

For each assessment task, we first calculated descriptive statistics for the two target morphemes. Specifically, we obtained means, standard deviations, and 95% confidence

intervals for participants' performance on the pretest and posttest by experimental condition. Next, we ran a series of independent samples t-tests to compare participants' pretest performance on each task. To address our research question, we carried a series of mixed model ANOVAs. In each analysis, the between-subject variable was the experimental condition (+highlight vs. –highlight), and the within-subject variable was time (pretest vs. posttest performance). The predictor of interest was the interaction between time and experimental condition. If a significant interaction effect was found, this meant that participants had achieved differential gains depending on the experimental condition. Finally, we also compared participants' performance on the comprehension questions by the means of independent samples t-tests to examine whether the experimental treatment had any influence on participants' comprehension of the texts. The alpha level was set at .05 for each analysis. Cohen's d and eta-squared values were computed to gauge effect sizes for the t-tests and ANOVAs respectively. Following Plonsky and Oswald (2014), d-values of .40, .70, and 1.00 and eta-squared values of .06, .16, and .36 were considered small, medium and large. Given the relatively small sample size for the Swedish group, we did not only consider significant but also potentially meaningful (reflected in effect sizes) when interpreting the findings emerging from the preliminary analyses.

Once we have all the data available, we plan to construct mixed effects models to address the research question. These analyses will enable us to take into account random item and participant effects, in addition to investigating the impact of the independent variables

### 3.7.2 Preliminary results

**Real-word derivational suffix choice task**

Table 3.7.2 presents the descriptive statistics for the real-word suffix choice task, and Table 3.7.3 summarizes the results of the independent samples t-tests comparing participants' pretest scores on the test. No significant differences were found between the experimental and control groups' pretest scores for either morpheme in the two contexts, but students achieved higher pretest scores on the *–ion* than *–ment* items.

As shown in Table 3.7.2, none of the groups displayed considerable change from the pretest to the posttest, except for the experimental group on the *–ment* items in the Swedish context. The results of mixed-model ANOVAs comparing the groups' pretest-posttest performance yielded no significant effect for the interactions between time and condition for any of the tests (see Table 3.7.3). It is worth noting, however, that the effect size was relatively large (.12) for the *–ment* morpheme in the Swedish context.

To sum up, highlighting did not show any significant effects on participants' performance on the real-word derivational suffix choice task. However, highlighting led to meaningful gains on the *–ment* items for Swedish students, as reflected in a close to medium effect size for the interaction between time and experimental condition.

**Table 3.7.2.** Descriptive statistics for the real-word suffix choice task by context and group

| | | Pretest | | | | Posttest | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Mean % | SD | 95% CI Lower | 95% CI Upper | Mean % | SD | 95% CI Lower | 95% CI Upper |
| Spain | | | | | | | | | |
| *-ion* | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -Highlight | 28 | .63 | .33 | .51 | .74 | .62 | .35 | .49 | .74 |
| +Highlight | 33 | .49 | .32 | .38 | .61 | .52 | .32 | .42 | .63 |
| *-ment* | | | | | | | | | |
| -Highlight | 28 | .18 | .28 | .08 | .29 | .27 | .26 | .18 | .37 |
| +Highlight | 33 | .19 | .28 | .10 | .30 | .14 | .20 | .07 | .21 |
| Sweden | | | | | | | | | |
| *-ion* | | | | | | | | | |
| -Highlight | 16 | .69 | .28 | .54 | .83 | .79 | .21 | .69 | .88 |
| +Highlight | 12 | .72 | .28 | .58 | .86 | .64 | .39 | .42 | .83 |
| *-ment* | | | | | | | | | |
| -Highlight | 16 | .42 | .35 | .25 | .58 | .50 | .34 | .33 | .67 |
| +Highlight | 12 | .28 | .37 | .11 | .50 | .47 | .36 | .28 | .67 |

**Table 3.7.3.** Results of independent-samples t-tests comparing groups based on pretest performance on real-word suffix choice task

| | t | Df | P | 95% CI Lower | 95% CI Upper | D |
|---|---|---|---|---|---|---|
| Spain | | | | | | |
| *-ion* | -1.62 | 59 | .11 | -.30 | .03 | .43 |
| *-ment* | .19 | 59 | .85 | -.13 | .16 | .04 |
| Sweden | | | | | | |
| *-ion* | .32 | 26 | .75 | -.19 | .26 | .11 |
| *-ment* | -1.00 | 26 | .32 | -.42 | .15 | .39 |

**Table 3.7.4.** Results of mixed model ANOVAs comparing groups based on pretest-posttest performance on real-word suffix choice task

| | Factor | F | p | partial eta$^2$ |
|---|---|---|---|---|
| Spain | | | | |
| *-ion* | Time | .03 | .87 | <.01 |
| | Time * Condition | .14 | .71 | <.01 |
| *-ment* | Time | .24 | .63 | <.01 |
| | Time * Condition | .51 | .12 | .04 |
| Sweden | | | | |
| *-ion* | Time | 1.58 | .22 | .06 |
| | Time * Condition | 1.58 | .22 | .06 |
| *-ment* | Time | 3.45 | .07 | .12 |
| | Time * Condition | .55 | .46 | .02 |

**Non-word derivational suffix choice task**

Table 3.7.5 gives the descriptive statistics for non-word suffix choice task, and Table 3.7.6 presents the results of the independent samples t-tests that compared participants' pretest scores in the experimental and control groups on the test. None of the t-tests yielded a significant difference between the experimental and control conditions, but the effect size was in the medium range for Swedish participants on the *–ment* items, indicating an advantage for the control group. Similar to the real-world suffix choice task, participants obtained higher pretest scores on the *–ion* than *–ment* items.

Table 3.7.5 shows that Spanish students in the +highlight group exhibited a noteworthy decrease on the *-ion* items from the pretest to the posttest, whereas Swedish students in the +highlight group showed considerable gains on both the *–ion* and *–ment* items from the pretest to the posttest. The mixed-model ANOVAs only generated a significant interaction between time and condition for the *–ion* morpheme in the Swedish context, confirming an advantage for highlighting (see Table 3.7.6). It should also be acknowledged that a considerable effect size emerged for the *–ment* morpheme for Swedish learners, indicating meaningful gains for the highlighting group.

In summary, highlighting yielded a significant advantage for Swedish group on the *–ion* items on the non-word derivational suffix choice task. Highlighting also led to meaningful gains for Swedish students on the *–ment* items, reflected in the small effect size obtained for the interaction between time and experimental condition.

**Table 3.7.4.** Descriptive statistics for the non-word suffix choice task by context and group

| | | Pretest | | | | Posttest | | | |
|---|---|---|---|---|---|---|---|---|---|
| | N | Mean % | SD | 95% CI Lower | 95% CI Upper | Mean % | SD | 95% CI Lower | 95% CI Upper |
| Spain | | | | | | | | | |
| *-ion* | | | | | | | | | |
| -Highlight | 28 | .50 | .26 | .40 | .60 | .50 | .32 | .38 | .61 |
| +Highlight | 33 | .39 | .34 | .28 | .51 | .21 | .22 | .14 | .28 |
| *-ment* | | | | | | | | | |
| -Highlight | 28 | .25 | .32 | .14 | .36 | .20 | .28 | .10 | .31 |
| +Highlight | 33 | .20 | .23 | .13 | .28 | .15 | .21 | .08 | .23 |
| Sweden | | | | | | | | | |
| *-ion* | | | | | | | | | |
| -Highlight | 16 | .50 | .21 | .40 | .60 | .35 | .26 | .23 | .48 |
| +Highlight | 12 | .36 | .33 | .19 | .56 | .47 | .36 | .28 | .67 |
| *-ment* | | | | | | | | | |
| -Highlight | 16 | .36 | .32 | .21 | .52 | .47 | .28 | .33 | .60 |
| +Highlight | 12 | .15 | .23 | .04 | .28 | .33 | .40 | .11 | .58 |

**Table 3.7.5.** Results of independent-samples t-tests comparing groups based on pretest performance on non-word suffix choice task

| | T | df | P | 95% CI Lower | 95% CI Upper | D |
|---|---|---|---|---|---|---|
| Spain | | | | | | |
| *-ion* | -1.35 | 59 | .18 | -.26 | .05 | .36 |
| *-ment* | -.68 | 59 | .50 | -.19 | .09 | .18 |
| Sweden | | | | | | |
| *-ion* | -1.35 | 26 | .19 | -.35 | .07 | .51 |
| *-ment* | -1.90 | 26 | .07 | -.44 | .02 | .75 |

**Table 3.7.6.** Results of mixed model ANOVAs comparing groups based on pretest-posttest performance on non-word suffix choice task

| | Factor | F | P | partial eta$^2$ |
|---|---|---|---|---|
| Spain | | | | |
| *-ion* | Time | 2.82 | .10 | .05 |
| | Time * Condition | 2.82 | .10 | .05 |
| *-ment* | Time | 1.00 | .32 | .02 |
| | Time * Condition | <.01 | .98 | <.01 |
| Sweden | | | | |
| *-ion* | Time | .08 | .78 | <.01 |
| | Time * Condition | 4.31 | .05 | .14 |
| *-ment* | Time | 2.98 | .10 | .10 |
| | Time * Condition | .21 | .65 | .01 |

**Non-word derivational suffix decomposition task**

Table 3.7.7 presents the descriptive statistics for the Non-word derivational suffix decomposition task, and Table 3.7.8 provides a summary of the results of the independent samples t-tests conducted to compare participants' pretest performance on the test. The t-tests found no significant difference between the experimental and control groups' scores for either the –ion or –ment morpheme on the pretest. Interestingly, unlike on the suffix choice tasks, participants scored higher on the –*ment* than –*ion* items.

As Table 3.7.7 demonstrates, in neither context did any of the groups show a notable pretest-posttest change. The series of mixed-model ANOVAs, which were carried out to compare the experimental and control groups' pretest-posttest performance on the –*ion* and –*ment* items, generated no significant interaction effect between time and experimental condition for either the Spanish or Swedish participants (see Table 3.7.9).

To summarize, highlighting did not have any significant or meaningful impact on participants' performance on the non-word derivational suffix decomposition task.

**Table 3.7.7.** Descriptive statistics for the non-word suffix decomposition task by context and group

| | | Pretest | | | | Posttest | | | |
|---|---|---|---|---|---|---|---|---|---|
| Context/ Group | N | Mean % | SD | 95% CI Lower | 95% CI Upper | Mean % | SD | 95% CI Lower | 95% CI Upper |
| Spain | | | | | | | | | |
| *-ion* | | | | | | | | | |
| -Highlight | 28 | .33 | .27 | .24 | .43 | .32 | .28 | .23 | .42 |
| +Highlight | 33 | .30 | .26 | .22 | .38 | .20 | .25 | .12 | .29 |
| *-ment* | | | | | | | | | |
| -Highlight | 28 | .63 | .37 | .50 | .76 | .76 | .27 | .67 | .86 |
| +Highlight | 33 | .56 | .43 | .39 | .70 | .61 | .40 | .48 | .74 |
| Sweden | | | | | | | | | |
| *-ion* | | | | | | | | | |
| -Highlight | 16 | .23 | .26 | .10 | 35 | .31 | .31 | .17 | .48 |
| +Highlight | 12 | .31 | .33 | .14 | .50 | .22 | .29 | .06 | .39 |
| *-ment* | | | | | | | | | |
| -Highlight | 16 | .69 | .37 | .52 | .85 | .67 | .34 | .50 | .83 |
| +Highlight | 12 | .61 | .44 | .36 | .83 | .53 | .39 | .31 | .75 |

**Table 3.7.8.** Results of independent-samples t-tests comparing groups based on pretest performance on non-word suffix decomposition task

| | T | Df | P | 95% CI Lower | 95% CI Upper | d |
|---|---|---|---|---|---|---|
| Spain | | | | | | |
| *-ion* | -.45 | 59 | .66 | -.17 | .10 | .11 |
| *-ment* | -.73 | 59 | .47 | -.28 | .13 | .17 |
| Sweden | | | | | | |
| *-ion* | .68 | 26 | .50 | -.16 | .31 | .27 |
| *-ment* | -.49 | 26 | .63 | -.40 | .24 | .20 |

**Table 3.7.9.** Results of mixed model ANOVAs comparing groups based on pretest-posttest performance on non-word suffix decomposition task

| | Factor | F | p | partial eta$^2$ |
|---|---|---|---|---|
| Spain | | | | |
| *-ion* | Time | 1.54 | .22 | .03 |
| | Time * Condition | .93 | .34 | .02 |
| *-ment* | Time | 2.97 | .09 | .05 |
| | Time * Condition | .57 | .45 | .01 |
| Sweden | | | | |
| *-ion* | Time | <.01 | 1.00 | <.01 |
| | Time * Condition | 1.61 | .22 | .06 |
| *-ment* | Time | .33 | .57 | .01 |
| | Time * Condition | .11 | .74 | <.01 |

**Text comprehension scores**

Table 3.7.10 gives the descriptive statistics for the comprehension scores, and Table 3.7.11 presents the results of the independent samples t-tests comparing the experimental and control groups' average scores in the two contexts. As shown in Table 3.7.10, the control group performed better on the comprehension items in the Spanish context, but no notable difference was observed for Swedish learners. It is also worth noting that the Swedish group showed considerably better comprehension than the Spanish participants. Independent samples t-tests confirmed that in Spain the control group achieved significantly higher comprehension scores than the experimental group. The effect size was in the medium range.

**Table 3.7.10.** Descriptive statistics for the comprehension scores by context and group

| Context/Group | | Mean % | SD | 95% CI Lower | 95% CI Upper |
|---|---|---|---|---|---|
| Spain | | | | | |
| -Highlight | 28 | .52 | .14 | .47 | .57 |
| +Highlight | 33 | .37 | .19 | .31 | .44 |
| Sweden | | | | | |
| -Highlight | 16 | .70 | .11 | .64 | .75 |
| +Highlight | 12 | .62 | .21 | .49 | .72 |

**Table 3.7.11.** Results of independent-samples t-tests comparing groups based on comprehension scores

| Context | t | Df | p | 95% CI Lower | 95% CI Upper | d |
|---|---|---|---|---|---|---|
| Spain | -3.38 | 59 | <.01 | -.24 | -.06 | .90 |
| Sweden | -1.31 | 26 | .20 | -.21 | .05 | .48 |

### 3.7.3 Preliminary Discussion and Conclusion

Our research question asked the extent to which textual enhancement in the form of highlighting leads to development in the knowledge of L2 derivational morphology. To address this question, Greek, Romanian, Spanish and Swedish primary school students participate in a six-week experiment aimed at facilitating development in the use of the *–ion* and *–ment* derivational morphemes through highlighting. Our preliminary results, collected in the Spanish and Swedish contexts, revealed some advantage for highlighting among Swedish learners. The presence of highlighting led to superior gains in receptive knowledge of the grammatical information indicated by the target suffixes, as reflected in significantly larger, close to medium-size pretest-posttest gains on the *–ion* items in the non-word derivational suffix choice task by the experimental than the control group. Highlighting also resulted in meaningful pretest-posttest gains in receptive knowledge of the *–ment* morpheme for Swedish learners, as indicated in considerable effect sizes for the analyses comparing the experimental and control groups' performance on the real-word and non-word derivational suffix choice tasks. These results, overall, suggest that the acquisition of derivational morphology by child learners can be facilitated through textual enhancement, a finding that is in line with the results of Lee and Huang's (2008) meta-analysis, which yielded a small, but superior effect for textual enhancement on grammatical development more generally.

A question that arises, however, is why Spanish learners, unlike their Swedish counterparts, showed no significant or meaningful gains in receptive knowledge of the target morphological features as a result of being exposed to highlighting. A possible explanation might lie in the differential comprehension level displayed by the Spanish versus Swedish learners. Spanish learners achieved considerably lower comprehension scores than their Swedish peers, which suggests that the Spanish participants struggled more with understanding the content of the texts. This, in turn, might have made it more difficult for them to divide their attentional resources between the content of the text and the highlighted forms. This explanation is supported by the fact the +highlight group showed significantly lower comprehension scores than the –highlight group in the Spanish context. This could be interpreted as suggesting that the highlighting did succeed in drawing learners' attention to the target forms, but this had left learners with smaller amount of attention to devote to text comprehension. As a result, it might have been difficult for learners to detect the grammatical function of the target morphemes, given that this would have required a good level of comprehension.

It is also worth discussing why Swedish participants showed no gains on the non-word suffix decomposition task, whereas they displayed improvement on the suffix choice tasks. One way of accounting for this finding might be that the treatment was relatively implicit in nature, therefore failing to increase learners' awareness of the morphological structure of words. A more explicit and longer treatment might have been necessary to achieve gains on this task type.

Finally, the limitations of the study need to be acknowledged. First and foremost, this is research in progress. Our sample size, especially for the Swedish participants, was relatively low for the preliminary analyses presented here. Another limitation is that we were not able to make direct comparisons across the two L1 groups, given the differential comprehension levels displayed by the groups. The study would also have benefited from the administration of a delayed posttest, but due to practical constraints, this was not possible.

As mentioned previously, we are in the process of collecting data from additional 30 Swedish, 60 Greek, and 60 Romanian learners. Once we have obtained all the data (by mid-February 2020), we will conduct more sophisticated statistical analyses, using linear mixed effects models to address our research question. This type of analysis will make it possible to control for random participant and item effects, resulting in more trustworthy findings.

# 4 Focused Evaluations – Intervention Phase: Game Elaborative Feedback Study

## 4.1 Rationale for Game Study

In Deliverable 9.1 we presented three RQs derived from the literature. Across the iRead project, partners have chosen to address one or more of these questions. The question we focus on for this interim deliverable is RQ3: *What do children perceive within game feedback and how does this support their understanding?*

There is a growing body of empirical research in both traditional and digital interventions, such as serious games, that shows the critical importance of feedback in learning (Hattie and Timperley, 2007; Johnson et al., 2017). Feedback can support learning in a number of different ways. It reduces cognitive load and brings attention to part of the task; it signals a gap between performance and the learning aim; and it provides information for correcting inappropriate task strategies (Shute, 2008; Johnson et al., 2017). Yet, it has also been established that feedback can be delivered in different ways, and therefore the effectiveness of feedback in part depends on its design (Hattie and Timperley, 2007; Johnson et al., 2017; Narciss et al. 2013; Shute, 2008; Schrauben and Witmer, 2019). This has led to an effort to identify what makes feedback effective and a number of frameworks have been developed that seek to characterise feedback (Johnson et al., 2017; Narciss et al. 2013; Shute, 2008; Benton et al, 2018).

Across these frameworks a distinction is made between feedback that informs the learner about the correctness of their response, i.e. *outcome feedback* and feedback that supports the learner's understanding, i.e. *elaborative feedback*. Though outcome and elaborative feedback can be presented together (Johnson et al., 2017), it is elaborative feedback that has been evidenced to support the learner's understanding and leads to learning gains (Hattie and Timperley, 2007; Attali and van der Kleij, 2017; Schrauben and Witmer, 2019; Johnson et al., 2017). Elaborative feedback is characterised by *content, timing* and *modality.* Whereas outcome feedback is only corrective, elaborative feedback seeks to influence the learner's thinking and further response by providing additional *information* (Attali and van der Kleij, 2017). There are three key characteristics to how this information is designed:

- *Content* captures the level of information designed into the feedback, how complex and specific it is (Shute, 2008; Johnson et al., 2017; Narcis, 2008). Feedback is more effective when it is specific rather than vague, and less complex and lengthy (Shute, 2008). The information embedded in the feedback can vary. It can include support to understand the task, knowledge about the concepts covered in the task, flagging up specific errors, providing strategies to process the task, and giving support in developing meta-cognitive skills (Narciss, 2008; Benton et al., 2018; Hattie and Timperley, 2007).
- *Timing* reflects when the feedback is presented. Immediate feedback follows directly after an item response and delayed feedback comes at the end of a task (Van der Kleij et al 2012; Johnson et al., 2017).
- *Modality* captures whether the feedback is verbal or visual, building on multimedia theory's proposition that people learn visually and orally (Johnson et al., 2017; Mayer and Moreno, 2003). Johnson et al (2017) draw on past research to argue that in primarily visual

tasks, such as games, feedback presented orally is better processed (also Mayer and Moreno, 2003).

In parallel to the recognition that elaborative feedback can be delivered in different ways, the design and impact of feedback also depends on who the learner is (Johnson et al., 2017; Narciss et al. 2013; Attali and van der Kleij, 2017). For example, while delayed timing can benefit high ability learners, in the case of low ability learners and novice learners, immediate feedback is more likely to be remembered and is thus more effective (Attali and van der Kleij, 2017). However, as Johnson et al. (2017) argue 'the interaction between feedback strategies and characteristics of the individual learner is not well known'. This is particularly the case with novice learners, including young learners and learners who may struggle with a domain (Benton et al., 2018; Benton et al., 2019). Benton et al. (2018) observe that most of the research involving digital tools and their delivery of feedback has been carried out with university students (e.g. Johnson et al., 2017; Shute, 2008; Attali and van der Kleij, 2017). This knowledge gap has been also reflected in the design of learning games for primary school children's literacy learning, which have tended to privilege outcome feedback more so than elaborative feedback (Benton et al, 2018).

Within the iRead project, we designed the Navigo games to offer outcome feedback as well as elaborative feedback when the chid makes an error (see D6.1). The aim of our empirical research is to understand how primary school children understand and act upon a combination of outcome and elaborative feedback in these learning games. Guided by the question '*What do children perceive within game feedback and how does this support their understanding?*' we focused on two sub-questions:

- **RQ1:** Do children attend equally to outcome and elaborative feedback? Does one attract more attention over the other?
- **RQ2:** When children attend to elaborative feedback, do they accurately process it?

## 4.2 Methodology

A common methodology was followed in each study we report, though depending on the language and learning group, we evaluated a different Navigo game which had specific feedback qualities. In all of studies reported, the language features practiced in the games were identified in consultation with teachers to be relevant to the children's learning profiles. This was also triangulated through initial paper-based pre-tests carried out in which children read out words containing the features. The paper tests were used to establish that children made some errors on the focal features. We present the methodology here, and within each game study section we describe the focal game (s) in more detail.

**Procedure**

The studies reported under section 4 all follow the same methodology. All of the children were familiar with the game mechanics chosen through their participation in a previous phase of the research. This ensured that errors in the game were not mechanical and due to usability issues with the two games. The researcher introduced the format of the session explaining to the children that they would be playing two separate games. In order to draw their attention toward and understanding of the game feedback, an *active intervention approach* was used, detailed by van Kersteren et al. (2003). Active intervention involves asking children about

preceding plans, actions and evaluations during interaction with technology. Compared to other verbal interventions such as retrospection, van Kersteren et al. (2003) found that active intervention led to a higher number of verbalisations. In line with this, when the child got the first incorrect answer, the researcher intervened with the following set of questions (parenthesis indicates what each question prompt intended to measure):

- *Did you get that answer correct or incorrect?* (to identify if the child was aware of their error)
- *How do you know?* (to identify if the child noticed particular visual aspects of outcome feedback)
- *How did you choose your answer? Did you hear the hint and did it help you? If yes, how?* (to identify if the hint was noticed and the child's understanding)

**Data Collection and Analysis**

The child's game play session was recorded using screen recording software installed on the tablet used. This resulted in in video data capturing interactions with each of the games played, with one video for each child. To carry out video analysis, there needs to be a definition of the event coded. The event was defined as an error made by a child followed by the child receiving elaborative feedback. However, given that some games presented elaborative feedback after the second error, in the two Spanish studies (novices and EFL) and the Greek Struggling Readers study, the event coded comprises of two consequent errors on the same item (the first presents outcome feedback and the second outcome and elaborative feedback). Across the studies, the video was coded using the framework below developed to address the RQs.

**Table 4.1 – Coding framework**

| | |
|---|---|
| **RQ1 -** Do children attend equally to outcome and elaborative feedback? Does one attract more attention over the other? | |
| **Is the child aware of error?** | Yes-No |
| **Outcome feedback: Does the child notice it?** | Yes-No |
| **Elaborative feedback: Does the child notice it?** | Yes-No |
| **% of cues child notices from those available** | Ranging from 0-100% |
| **% of visual cues child notices from those available** | Ranging from 0-100% |
| **Specific visual cues noticed** | Open coding mapping to the visual cues identified in Table 1 |
| **% Verbal cues child notices of those available** | Ranging from 0-100% |
| **RQ2 -** When children attend to elaborative feedback, do they accurately process it? | |
| **Elaborative feedback - does the child understand it?** | Yes-No<br>Inductive coding of children's verbal responses to identify patterns that explain how they understood the feedback |

## 4.3 Partner Progress

The table below reports on the partners' progress on the game task.

*Table 4.2 – Partner progress*

| | Data Collection | Analysis | Deliverable report |
|---|---|---|---|
| **EFL** | | | |
| Sweden (UGOT) | *Completed* | *Completed* | *December 2019; section 4.7* |
| Greek (BC) | *Not participating* | | |
| Romanian (ULBS) | *Not participating* | | |
| Spanish (UB) | *Completed* | *Completed* | *December 2019; section 4.8* |
| ***Novice Readers*** | | | |
| English (UCL) | *Completed* | *Completed* | *December 2020* |
| Greek (Doukas) | *Not participating* | | |
| Spanish (UB) | *Completed* | *Completed* | *December 2019; section 4.4* |
| German (DHBW) | *Completed* | *Completed* | *Not reported** |
| ***Struggling Readers*** | | | |
| English (UCL) | *Completed* | *Completed* | *December 2019; section 4.5* |
| Greek (UOI) | *Completed* | *Completed* | *December 2019; section 4.6* |

* At the time of the study, it was not possible to switch off the background music for the German game. Given that this interfered with the children's ability to hear the elaborative feedback, we have chosen not to analyse this data, which anecdotally corroborate the general trends we found in the other studies.

## 4.4 Novice Readers – Spanish (UB)

### 4.4.1 Methodology

**Participants**

Eight children in Year 2 participated in this study (gender 4 females-4 males, 6-7 years old) attending a free school (semi-private school) in a town near Barcelona. The participants were all novice readers, with at least one year experience in reading, and they were randomly selected. In a previous phase of this study we had ran fluency and accuracy pre-tests. Participants showed that they combined sub-lexical strategies (phoneme by phoneme reading) with lexical ones (word by word) and displayed slightly different levels of reading fluency. All children made at least three errors. In total, they made 47 errors (43 were made in the masculine and feminine feature – see below).

**Game selection**

Children played three game mechanics: *Remove the Runes, Perilous Paths and Walk like an Egyptian (Figure 4.1)*. Two of the games presented them with phonological content, specifically in terms of GPC (the sound <b>), which was a rather beginner content that children were already familiarized with. The other two games dealt with more advanced content, related to suffixes (morphology). It consisted of two games about gender (words that

can be both masculine and feminine). In this study, the researchers provided a quick explanation about grammatical gender before starting to play the games. All children played the same games in the same order.

**Figure 4.1 – Focal Games for the Study**


**Perilous Paths**


**Remove the Runes**


**Watch your step**

In order to ascertain how the children may interact with the game feedback, we first conducted a systematic game design analysis. Whenever a child made an error within the game, the game provided *outcome feedback* to inform the child about the correctness of their response. In addition to this, the game offered *elaborative feedback* giving the child a hint on how to work out the correct answer. Outcome feedback was offered in a visual mode whereas elaborative feedback was verbal. Table 4.3 breaks down how the games provided outcome and elaborative feedback. We use the taxonomy offered by Lyster and Saito (2010) for verbal tutor led feedback to classify the elaborative feedback. It should be pointed out that that the metalinguistic feedback that had originally been designed for Spanish combined implicit metalinguistic feedback (e.g. rather than use the word 'subject', 7-year-olds were asked to 'pay attention to who did the action') and metalinguistic comparisons (e.g. 'b' as in the word 'bueno'). It is noted that the three focal games presented some differences reflected in Table 4.3:

- Remove the runes offered motivational feedback (e.g. keep trying) during the first error before elaborative feedback was provided in the second error. In the remaining two games, elaborative feedback was given after the first error.
- Perilous Paths and Remove the Runes offered the child repetition feedback by voicing out the incorrect response to signal to the child their error alongiside providing metalinguistic clues regarding the language rule.

**Table 4.3 – Analysis of game feedback**

| Game | Language feature | Outcome feedback | Elaborative feedback | Feedback type | Total cues | Visual cues | Verbal cues |
|---|---|---|---|---|---|---|---|
| **Perilous Paths** | *Sound <b>* | Bridge breaks<br><br>Word selected appears in red<br><br>Gems earned/lost | Game reads out incorrect answer | *Repetition* | 5 | 3 | 2 |
| | | | Hint: "Palabras como beso empiezan con el sonido b" (words like 'beso' start with the sound b) | *Metalinguistic* | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Remove the runes** | *Sound <b>* | Word selected appears in red<br><br>Word disappears<br><br>Gems earned/lost<br><br>"Sigue intentándolo" (keep trying) | Game reads out incorrect answer | *Repetition* | 6 | 3 | 3 |
| | *Gender* | | Game reads out incorrect answer | *Repetition* | | | |
| | | | Palabras como el/la azúcar pueden ser masculinas y femeninas (Words like 'sugar' can be masculine or feminine) | *Metalinguistic* | | | |
| **Walk like an egyptian** | *Gender* | Word selected appears in red<br><br>Word disappears<br><br>Gems earned/lost | Palabras como artista pueden ser masculinas y femeninas (Words like 'artist can be masculine or feminine) | *Metalinguistic* | 4 | 3 | 1 |

### 4.4.2 Findings

***RQ1 - Do children notice elaborative feedback and which is more salient: verbal (elaborative) or visual (outcome)?***

After each error they made, children were prompted to explain their understanding of the outcome of their game play. All of the children verbally acknowledged making an error suggesting that the game was effective in communicating outcome feedback.

When children were asked to share the specific cues that supported them in reaching this conclusion, most of the time they were able to identify the specific cues that supported this understanding. However, some children were not able to justify that answer. In three cases, they reported knowing it was correct because they knew the word started with letter "b", but that actually had nothing to do with any type of specific feedback but only with their own knowledge. Therefore, even though the game design supported the children's recognition that an error was made, children were not always able to articulate the cues they perceived to support their inferences.

Generally, the first answer of the participant referred to was visual clues, so they noticed whether the word turned green or red, and whether the word disappeared or not. No children reported noticing losing jewels. Out of 47 errors, with 23 instances of metalinguistic elaborative feedback, only in 9 of the errors the children reported to have heard the elaborative feedback.

***RQ2– When children attend to it, do they process elaborative feedback?***

In two of the 9 times children heard the elaborative feedback, the participants reported that this feedback was not helpful at all. E.g. one child said: "The game tells me that 'el la azúcar'

is an example, but I don't get it". In this last case, the researcher actually elaborated the elaborative feedback to make the children understand.

### 4.4.3 Summary

On the basis of our analysis, we have been able to take a stepwise approach to the interpretation of what may be going on with elaborative feedback. Firstly, learners may not notice elaborative feedback at all. Having a salient and clearly identifiable voiceover which provides more or less direct information as to how to solve a linguistic problem is no guarantee that they will process it. Attention during game play may be divided to the point that other stimuli are attended to at the expense of processing elaborative feedback. Their inevitable detection of the voiceover may have not turned into intake for further processing (Leow, 2015). Secondly, even if they processed it because they reported having heard it, there is no guarantee that they should extract meaning from the explanation. Thirdly, even if they heard the feedback and the feedback included a meaningful explanation, the conceptual content (e.g. the fact that some words can be both masculine and feminine at the same time as the word 'artista' – 'el artista', 'la artista') may have been too far from their current level of knowledge and they therefore missed it altogether. All in all, our data suggest that elaborative feedback as used in our design may have had a very limited impact on raising their linguistic awareness and consequently solving the linguistic problems they faced.

*Did children attend to outcome feedback more so than elaborative feedback?*
Our data clearly showed that children attended more to outcome feedback than they did to elaborative feedback. In general, the first and more recurrent clue participants reported noticing was that the word turned either green or red and this meant right or wrong.

*Which visual cues in particular draw children's attention to the outcome feedback?*
As reported in the previous question, the most salient feature was the colour of the word selected, which would turn either green or red. Also, some participants referred to the bridge falling down when they were wrong in Perilous Paths game.

*Did children understand how to action the elaborative feedback?*
Overall verbal feedback was not quite understood by the majority of the children. Also, it was noticeable that very challenging games would make the children feel anxious, since they would continuously have outcome and elaborative feedback in a way that may have prevented them from processing and understanding the content they were dealing with. At this point we believe that the impact of elaborative feedback was low.

## 4.5 Readers with Dyslexia/Struggling to Read – English (UCL)

### 4.5.1 Methodology

**Participants**
Twenty-six children in Years 4 and 5 participated in this study (aged 8-10) across four different schools in London. All children were identified as struggling readers by the special needs coordinator of their school. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Of a total of 26 children, 6 children did not make an error in the games and will not be considered in the analysis. Of the remaining 20 children all made at least one error (with 5 participants making two errors). This group of 20 children forms the main focus of our analysis. In total we analysed 25 game errors.

**Game selection**

Children played two game mechanics: *Crocotiles* and *Perilous Paths (Figure 1)*. The games focused on the language category 'morphology' presenting six different prefixes and suffix language features. Each child encountered two out of the six language features.

**Figure 4.2 – Focal Games for the Study**


**Perilous Paths** **Crocotiles**

In order to ascertain how the children may interact with the game feedback, we first conducted a systematic game design analysis. In each of the games the child was presented with three distinct rounds. If the child made an error within the round, the game provided *outcome feedback* to inform the child about the correctness of their response. In addition to this, the game offered *elaborative feedback* giving the child a hint on how to work out the correct answer. The outcome feedback was offered in a visual mode whereas the elaborative feedback was verbal. Table 4.5 breaks down how both games provided outcome and elaborative feedback. It is noted that Perilous Paths offered fewer verbal cues in its elaborative feedback. We use the taxonomy offered by Lyster and Saito (2010) for verbal tutor led feedback to classify the elaborative feedback. In particular, our games either offered the child repetition feedback by voicing out the incorrect response to signal to the child their error, or provide metalinguistic clues regarding the language rule to be used in order to correct the error.

**Table 4.4 – Analysis of game feedback**

| Game | Language feature | Outcome feedback | Elaborative feedback | Feedback type | Total cues | Visual cues | Verbal cues |
|---|---|---|---|---|---|---|---|
| Perilous Paths | *Prefixes negatives: non, de. E.g. deconstruct* | Bridge breaks<br><br>Word selected appears in red<br><br>Gems earned/lost | Game reads out incorrect answer | *Repetition* | 5 | 3 | 2 |
| | | | Hint: "These prefixes are all related to negatives or opposites. Think of how the prefix will change the meaning of the word you are trying to complete" | *Metalinguistic* | | | |
| | *Derivational noun suffixes: -ent/-ence/-ty/-ity/-ness* | | Game reads out incorrect answer | *Repetition* | | | |
| | | | Hint: "Look for a noun" | *Metalinguistic* | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *-ing with a change of letter* | | Game reads out incorrect answer | *Repetition* | | | |
| | | | Hint: "Think about when the events of the sentence took place" | *Metalinguistic* | | | |
| Crocotiles | *Adverb Suffix:- ly* | Word selected appears in red<br><br>Word disappears<br><br>Gems earned/lost | Hint: "Look for an adverb" | *Metalinguistic* | 4 | 3 | 1 |
| | *Superlative adjectives: -est* | | Hint: "Consider the structure of the sentence and think of whether we compare one or two things" | *Metalinguistic* | | | |

**Findings**

***RQ1 - Do children notice elaborative feedback and which is more salient: verbal (elaborative) or visual (outcome)?***

After each error they made, children were prompted to explain their understanding of the outcome of their game play. All of the twenty children verbally acknowledged making an error suggesting that the game was effective in communicating outcome feedback.

When children were asked to share the specific cues that supported them in reaching this conclusion, in 18 out of the 25 errors they were able to identify the specific cues that supported this understanding. The rest of the times, children either did not mention any visual cues, or when probed to explain the cues they saw, they were not able to. Therefore, even though the game design supported the children's recognition that an error was made, children were not always able to articulate the cues they perceive to support their inferences.

From the total of 25 errors, in almost half of the cases (10 errors) children reported *not* hearing the elaborative verbal feedback in the game. The Perilous Paths game in particular voiced out a target sentence with a missing word at the start of each game round e.g. "Sign language is__ verbal". The child's task was to fill in the gap by choosing one of three options. Upon the child's wrong choice selection e.g. "de", the game voiced the selection, providing elaborative 'repetition' feedback that could be used by the child to infer that the resultant sentence did not make sense. None of the children, however, seemed to notice this feedback. Moreover, in one example, while the elaborative metalinguistic feedback was being read aloud, one child's attention was already diverted to correcting his response. As the hint was playing the child was already moving a new tile suggesting that he ignored the feedback.

The trend that children focused more so on outcome rather than elaborative feedback was corroborated when looking more closely at the cues that children mentioned noticing. On the whole children noticed the visual (outcome) feedback more than the verbal (elaborative). In the event of an error, Crocotiles presented children with 4 cues (3 visual/outcome, 1 verbal/elaborative). Focusing on those children who had noticed the outcome feedback, they identified *54%* of the total cues presented in the Crocotiles game, on average split against an average of 38% visual and 17% in verbal. When it came to visual feedback most of the children

noticed the word changing to red followed by the word disappearing. Only one child identified that they had lost jewels. Perilous Paths presented children with 5 cues (4 visual/outcome, 2 verbal/elaborative). Of those children who had noticed the outcome feedback, children identified *39%* of the total cues on average split against 30% visual and 9% verbal. Children focused on the word changing to red as much as they noticed the bridge breaking.

***RQ2– When children attend to it, do they process elaborative feedback?***
We now focus on the total of 15 errors during which children reported noticing (hearing) the elaborative feedback. When prompting children to explain the hint, there were 10 instances where the children could not either call, or accurately recall, what the feedback said though many of them claimed it was helpful. In five cases of children who had not attended to the visual outcome feedback they treated the elaborative feedback as a cue that suggested their response was incorrect. As one child explained, the hint gives a clue to "just pick a different answer". In doing this, children subverted the design of the elaborative feedback to inform their understanding of their performance. Our findings show that children are not strategically using elaborative feedback to correct their error.

Despite this trend, two children were able to explain how they used the feedback to correct their response. As one child explained “It (the hint) tells you it has an adverb and I know that (the correct answer) was an adverb at the end and that's why I chose that one”. Additionally, in 10 of these 15 errors children recovered when trying again. To self-correct, most of the children reported relying on their own cognitive strategies – given the task at hand to construct a meaningful sentence, the main strategy was to try out the word options mentally in order to make sense of the sentence they produced.

### 4.5.2 Summary

*Did children attend to outcome feedback more so than elaborative feedback?*
Our findings show that in the presence of both outcome and elaborative feedback during an error struggling readers tend to attend and use the former as input for their next action. This is also corroborated in showing that children tend to focus on visual cues (in our game design these tended to be used in outcome feedback) more so than verbal cues (in our game design these delivered the elaborative hints).

*Which visual cues in particular draw children’s attention to the outcome feedback?*
Each game presented 3-4 visual cues for outcome feedback. Only a subset of these cues was salient, especially the colour of the incorrect response. Other cues (e.g. losing gems) that were not noticed as frequently by the children could be argued to support the game experience and might become more prominent as children would play the game over time. Our findings thus show that children are only aware of a subset of the cues available in the game design.

*Did children understand how to action the elaborative feedback?*
Overall the verbal feedback was not understood by the majority of the children. As table 4.4 shows, the feedback across the games varied in length and sentence complexity. Yet these factors did not seem to play a role in this. Taking this finding at face value there is a need to engage in more design and evaluative research on this topic. Though our research design does not allow us to claim whether this group of children may respond better to visual over verbal feedback, future work can compare *visual to verbal elaborative feedback* to establish this.

We also note that though children did not understand the elaborative feedback they received, in 2/3 of the errors they were able to recover independently from their errors in their next try. This contrasts with findings we have reported in Benton et al (2019) with young children (Years 1/2) who were unable to progress past their error in a literacy game about half of the time.

## 4.6 Readers with Dyslexia/Struggling to Read – Greek (UOI)

### 4.6.1 Methodology

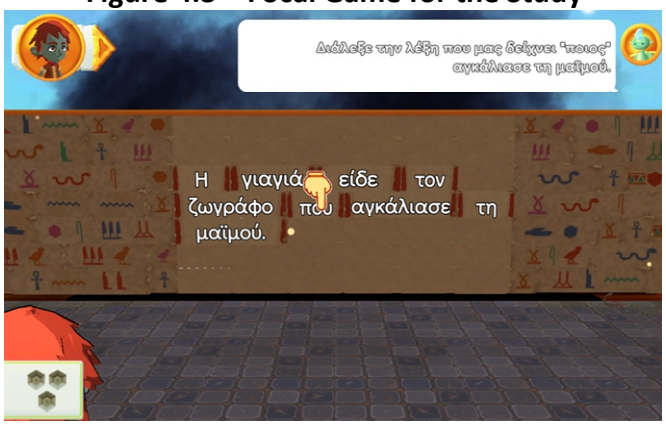
**Participants**

Eighteen children in Years 4 and 5 (aged 8-10) participated in this study. Children were recruited from six different public schools in Ioannina, Greece. All children were identified as struggling readers by the special needs coordinator of their school. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Of a total of 18 children, 3 children did not make an error in the games and will not be considered in the analysis. Of the remaining 15 children all made at least one error (with 7 participants making two errors). This group of 15 children forms the main focus of our analysis. In total we analysed 15 game errors.

**Game selection**

Children played two games introducing two different features: *Anubrick* with Object of the Verb (in Greek: Η αναφορική πρόταση ακολουθεί την κύρια και αναφέρεται στο αντικείμενο (που: σε θέση υποκειμένου) and Adverial clauses with before (in Greek: Εξαρτημένες προτάσεις: πριν) *(Figure 4.3)*. The games focused on the language category 'syntax' presenting sentences containing the target language feature. In the game children were asked to read sentences and answer a comprehension question by tapping the correct response within the sentence.

**Figure 4.3 – Focal Game for the Study**




**Anubrick**

In order to ascertain how children may interact with the game feedback, we first conducted a systematic game design analysis. In our game the child was presented with three distinct rounds. If the child made an error within the round, the game provided *outcome feedback* to inform the child about the correctness of their response. In addition to this, the game offered *elaborative feedback* giving the child a hint on how to work out the correct answer. The outcome feedback was offered in a visual and verbal mode whereas the elaborative feedback was verbal only. Table 4.5 breaks down how our selected game provides outcome and

elaborative feedback. In particular, Anubrick in the first error offered the child less informative feedback by voicing out that their response was incorrect and that they had to try again (outcome feedback), and in the second error on the same item provided metalinguistic clues regarding the language feature to be used in order to correct the error.

**Table 4.5 – Analysis of game feedback**

| Game | Language feature | Outcome feedback | Elaborative feedback | Feedback type | Total cues | Visual cues | Verbal cues |
|---|---|---|---|---|---|---|---|
| Anubrick | *Subject Relative clauses (e.g., The teacher saw the man that kissed Mary)* | Wrong words selected appears in red<br><br>Gems earned/lost<br><br>Game reads out "This was wrong, try again" | Game reads out incorrect answer | | 4 | 2 | 2 |
| | | | Hint: "Think who does what to whom" | *Metalinguistic* | | | |
| | | | | | | | |

## 4.6.2 Findings

***RQ1 - Do children notice elaborative feedback and which is more salient: verbal (elaborative) or visual (outcome)?***

After each error they made, children were asked to explain their understanding of the outcome of their game play. All of the children acknowledged making an error suggesting that the game was effective in communicating outcome feedback.

When children were asked to share the specific cues that supported them in reaching this conclusion, they were able to identify some visual cues that supported this understanding. However, sometimes children responded that they understood the answer was incorrect but they did not mention any visual cues, or when probed to explain the cues they saw, they were not able to. Therefore, even though the game design supported the children's recognition that an error was made, children were not always able to articulate the cues they perceive to support their inferences.

From the total of 15 errors, in 10 errors children did not provide any of the visual cues noticed (only 5 responses "word turning red" were counted). In terms of noticing the elaborative feedback, only in 5 errors children reported *what* the elaborative verbal feedback was in the game. In some cases (4 errors) the child reported s/he heard the hint but couldn't recall it.

In the Anubrick game the target sentence *"The man saw the doctor who kissed the dog"* is presented on the screen with the following instructions: Select the correct word that shows: "*Who kissed the dog*". The child is instructed to select the correct word that best answers the question. Upon the child's wrong choice selection e.g. "the man", the game voiced that the choice was not correct, providing elaborative feedback saying *"Think: Who does what to whom*", that helps the child to understand that the resultant sentence did not make sense.

Only 5 children, however, seemed to notice this feedback. For the majority of the children, the hint was largely ignored.

The trend that children focused more so on outcome rather than elaborative feedback was corroborated when looking more closely at the cues that children mentioned noticing. On the whole children noticed the visual (outcome) feedback more than the verbal (elaborative).

Focusing on those children who had noticed the outcome feedback, they identified *27%* of the total cues presented in the Anubrick game, on average split against an average of 17% of visual hints (only in 5 cases one out of two visual hints was identified) and 63% in verbal (11 children noticed only the first outcome feedback but only 5 children noticed the elaborative feedback (31,25%). With respect to visual feedback most of the children noticed the word changing to red when incorrect but no child identified that they had lost jewels.

***RQ2– When children attend to it, do they process elaborative feedback?***
We now focus on the total of 9 errors during which children reported noticing (hearing) the elaborative feedback.

When prompting children to explain the hint, there were 4 instances where the children could not either call, or accurately recall, what the feedback said though many of them claimed it was helpful. In 5 cases only the elaborative feedback was recalled accurately. In 7 cases of children who had not attended to the visual outcome feedback they treated the outcome and elaborative feedback as a cue that suggested their response was incorrect.

Importantly, our findings show that children are not strategically using elaborative feedback to correct their error. Some children were able to repeat the elaborative feedback without being able to explain what this means, by using their words so it is unclear if they properly understood it. However, in 4 of these 5 errors children recovered when trying again.

### 4.6.3 Summary

*Did children attend to outcome feedback more so than elaborative feedback?*
Our findings show that in the presence of both outcome and elaborative feedback during an error struggling readers tend to attend and use both as input for their next action. This is also corroborated in showing that children tend to focus more on visual cues and outcome feedback (“this was incorrect, please try again”) than on metalinguistic elaborative hints.

*Which visual cues in particular draw children’s attention to the outcome feedback?*
Each game presented 2 visual cues for outcome feedback. Only a subset of these cues was salient, especially the colour of the incorrect response. Other cues (e.g. losing gems) were not noticed by the children. It could be argued though that a more extensive use of the game might facilitate children’s attention into those cues over time. Our findings show that children are only aware of a subset of the cues available in the game design.

*Did children understand how to action the elaborative feedback?*
Overall the verbal elaborative feedback was not understood by the majority of the children. Though our research design does not allow us to claim whether this group of children may respond better to visual over verbal feedback, future work can compare *visual to verbal elaborative feedback* to establish this.

## 4.7 EFL – Swedish L1 (UGOT)

### 4.7.1 Methodology

**Participants**

Twenty-eight children in year 4 participated in this study (aged 10) from one school in Kungsbacka, Sweden. The children were invited to participate as part of their English lessons (EFL). The children who participated had all selected to do so themselves. One recording quit unexpectedly and the data from that child is therefore lost. Of a total of 27 children with complete screen recordings, 3 children did not make an error in the games and will not be considered in the analysis. Of the remaining 24 children all made at least one error (with 12 participants making two errors). This group of 24 children forms the main focus of our analysis. In total we analysed 35 game errors.

**Game Selection**

Children played two game mechanics: *Crocotiles* and *Perilous Paths (Figure 4.4)*. The games focused on the language category 'morphology' presenting two different comparative adjective language features.

**Figure 4.4 – Focal Games for the Study**


**Perilous Paths** **Crocotiles**

In order to ascertain how the children may interact with the game feedback, we first conducted a systematic game design analysis. In each of the games the child was presented with three distinct rounds. If the child made an error within the round, the game provided *outcome feedback* to inform the child about the correctness of their response. In addition to this, the game offered *elaborative feedback* giving the child a hint on how to work out the correct answer. The outcome feedback was offered in a visual mode whereas the elaborative feedback was verbal. Table 1 breaks down how both games provided outcome and elaborative feedback. It is noted that Perilous Paths offered fewer verbal cues in its elaborative feedback. We use the taxonomy offered by Lyster and Saito (2010) for verbal tutor led feedback to classify the elaborative feedback. In particular, our games either offered the child repetition feedback by voicing out the incorrect response to signal to the child their error, or provide metalinguistic clues regarding the language rule to be used in order to correct the error.

**Table 4.6 – Analysis of game feedback**

| Game | Language feature | Outcome feedback | Elaborative feedback | Feedback type | Total cues | Visual cues | Verbal cues |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Perilous Paths | *Comparative adjectives*<br>*-er, est*<br>*-ier, -iest* | Bridge breaks<br><br>Word selected appears in red<br><br>Gems earned/lost | Game reads out incorrect answer | *Repetition* | 5 | 3 | 2 |
| | | | Hint: "Consider the structure of the sentence and think of whether we compare one or two things" | *Metalinguistic* | | | |
| Crocotiles | *Comparatives adjectives*<br>*-er, -est* | Word selected appears in red<br><br>Word disappears<br><br>Gems earned/lost | Hint: "Consider the structure of the sentence and think of whether we compare one or two things" | *Metalinguistic* | 4 | 3 | 1 |

### 4.7.2 Findings

***RQ1 - Do children notice elaborative feedback and which is more salient: verbal (elaborative) or visual (outcome)?***

After each error they made, children were prompted to explain their understanding of the outcome of their game play. All of the twenty-four children verbally acknowledged making an error suggesting that the game was effective in communicating outcome feedback.

When children were asked to share the specific cues that supported them in reaching this conclusion, in 26 out of the 35 errors they were able to identify the specific cues that supported this understanding. The rest of the times, children either did not mention any visual cues, or when probed to explain the cues they saw, they were not able to. Therefore, even though the game design supported the children's recognition that an error was made, children were not always able to explain the cues they perceive to support their inferences.

From the total of 35 errors, in only 7 cases did the children report *not* noticing the elaborative verbal feedback in the game. Out of those, 11 reported that they did not hear what the hint said. 13 reported that they could hear it, but did not understand what it said. The Perilous Paths game in particular voiced out a target sentence with a missing word at the start of each game round e.g. "My cousin is very__ ". The child's task was to fill in the gap by choosing one of three options. Upon the child's wrong choice selection e.g. "friendlier", the game voiced the selection, providing elaborative 'repetition' feedback that could be used by the child to infer that the resultant sentence did not make sense. None of the children, however, seemed to notice this feedback. Moreover, on several occasions, while the elaborative metalinguistic feedback was being read aloud, the children's attention was already diverted to correcting their response. As the hint was playing the children were already moving a new tile suggesting that they ignored the feedback.

The trend that children focused more on outcome rather than elaborative feedback was corroborated when looking more closely at the cues that children mentioned noticing. On the

whole children noticed the visual (outcome) feedback more than the verbal (elaborative). In the event of an error, Crocotiles presented children with 4 cues (3 visual/outcome, 1 verbal/elaborative). Focusing on those children who made errors and noticed the outcome feedback, they identified *38%* of the total cues presented in the Crocotiles game, on average split against an average of 22% visual and 17% in verbal. When it came to visual feedback most of the children noticed the word changing to red followed by the word disappearing. None of the children identified that they had lost jewels. Perilous Paths presented children with 5 cues (4 visual/outcome, 2 verbal/elaborative). Of those children who had noticed the outcome feedback, children identified *41%* of the total cues on average split against 23% visual and 18% verbal. Children focused on the word changing to red slightly more than the bridge breaking.

***RQ2– When children attend to it, do they process elaborative feedback?***
We now focus on the total of 28 errors during which children reported noticing (hearing) the elaborative feedback. When prompting children to explain the hint, only one could do so. This was also the only one that claimed that the hint was useful. For the rest of the instances, the children reported either not hearing properly what the hint said or not understanding it. One child said that she was not prepared for the hint to come and therefore did not hear it. Another child stated "I'm not very good at English". The explanation "I usually don't listen, I read instead" was offered as to why one child had not heard the hint. Our findings show that the children are not strategically using the elaborative feedback to correct their errors.

23 children recovered when trying again after receiving elaborative feedback. However, this was not due to the feedback as they either did not hear or understand it. The one child who did report to understand the hint actually made the error on purpose because he was curious to find out what the hint was, but he said that it would have helped him if he had needed it. To self-correct, most of the children reported relying on their own cognitive strategies. Many reported trying out what sounded (17 children) or felt right (4), other translated the sentence (2) to try to make sense of the sentence they produced that way. A few children also looked to the game mechanics for help. When playing Crocotiles, some children (5) described how they looked at the length of the words and figured out whether it required one or two leaves.

### 4.7.3 Summary

*Did children attend to outcome feedback more so than elaborative feedback?*
Our findings show that in the presence of both outcome and elaborative feedback during an error struggling readers tend to attend and use the former as input for their next action. This is also corroborated in showing that children tend to focus on visual cues (in our game design these tended to be used in outcome feedback) more so than verbal cues (in our game design these delivered the elaborative hints).

*Which visual cues in particular draw children's attention to the outcome feedback?*
Each game presented 3 visual cues for outcome feedback. Only a subset of these cues was salient, especially the colour of the incorrect response. Other cues (e.g. losing gems) that were not noticed as frequently by the children could be argued to support the game experience and might become more prominent as children would play the game over time. Our findings thus show that children are only aware of a subset of the cues available in the game design.

***Did children understand how to action the elaborative feedback?***

Overall the verbal feedback was not understood by the majority of the children. We also note that though the children did not understand the elaborative feedback they received, in 23/28 of the errors they were able to recover independently from their errors in their next try.

## 4.8 EFL – Spanish L1 (UB)

### 4.8.1 Methodology

**Participants**

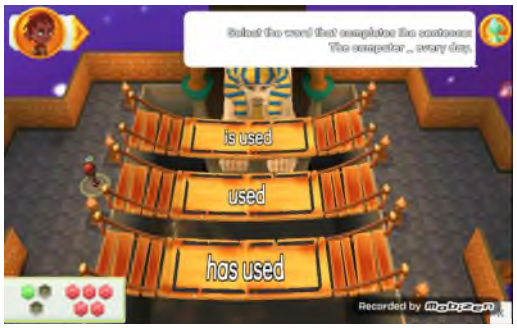
Nine children in Year 6 participated in this study (2 male; aged 11-12) in a free school in Sant Feliu de Llobregat, in the Barcelona area. All children were learning English as a Foreign Language as part of their regular school program. Of a total of 9 children, 1 boy did not make an error in the games and will not be considered in the analysis. Of the remaining 8 children all made at least one error. This group of 8 children forms the main focus of our analysis. In total we analysed 30 game errors.

**Game selection**

Children played three game mechanics: Cogelisk, Perilous Paths, and Crocotiles (Figure 4.5). The games focused on two language categories 'quantifiers' (Cogelisk) and 'passives' (Perilous Paths and Crocotiles). The language features were identified in consultation with teachers to be relevant to the children's learning profiles. This was also verified through an initial paper-based pre-test carried out, establishing that children made some errors on the focal features. The feature 'quantifiers' was familiar to the students from use of the games in an earlier stage of the research, while the feature 'passives' was new to them in terms of use with the Navigo games. The game mechanics were all familiar to the students through their participation in a previous phase of the research. This ensured that errors in the game were not mechanical or due to usability issues with the games. No errors were made by any child in the Crocotiles game, largely because less than 30% of the trials allowed any possibility of an error due to mechanical deficiencies with the particular version of the software, and therefore we have excluded the Crocotiles game from this analysis.

**Figure 4.6 – Focal Games for the Study**


**Cogelisk**




**Perilous Paths**

In order to ascertain how the children may interact with the game feedback, we first conducted a systematic game design analysis. In each of the games the child was presented with three distinct rounds. Whenever the child made a selection within a round, the game offered outcome feedback to inform them of the correctness of their response. In the Perilous Paths game, the chosen response was repeated to the child after it was selected, and the entire correct sentence was repeated verbally if the correct answer had been selected. In addition to this, if the child made an incorrect choice, the game offered elaborative feedback giving the child a hint on how to work out the correct answer. This elaborative feedback was given after the first and second errors in the Perilous Paths game, but only after the second (consecutive) error in the Cogelisk game (the first error in a round only led to verbal outcome feedback - e.g. "Try that one again"). The outcome feedback was offered in a combination of visual, auditory, and verbal modes whereas the elaborative feedback was solely verbal. Table 4.7 breaks down how both games provided outcome and elaborative feedback. It is noted that Perilous Paths offered a much larger number of cues, especially when students made mistakes: 6 cues per mistake compared with two per mistake in Cogelisk.

**Table 4.7 – Analysis of game feedback**

| Game | Language feature | Outcome feedback | Elaborative feedback | Cues per incorrect response |
|---|---|---|---|---|
| **Perilous Paths** | *Passives*<br><br>*"This cinema was built 20 years ago."* | Bridge breaks and avatar runs back<br>Word selected appears in red<br>Sphinx shakes its head<br>Gems lost | Game reads out selected answer<br><br>Game says: "The passive construction includes a form of the verb 'be'" | 6<br>(4 visual, 2 verbal) |
| **Cogelisk** | *Quantifiers*<br>*"This coffee has too much sugar."* | Game says: "Incorrect, keep trying" or "Try that one again" | Game says: "Think about the meaning of the sentence, and whether you can count the noun after the cog." | 2<br>(2 verbal) |

### 4.8.2 Findings

***RQ1 - Do children attend equally to outcome and elaborative feedback? Does one attract more attention over the other?***

After each error they made, children were prompted to explain their understanding of the outcome of their game play. All of the children verbally acknowledged making an error suggesting that the game was effective in communicating outcome feedback.

When children were asked to share the specific cues that supported them in reaching this conclusion, responses varied. Every child managed to articulate at least one cue for at least one of their errors. In all cases of errors during the Perilous Paths game, and in most cases of errors during the Cogelisk game, children identified at least one cue that had led them to understand that they had made an error. Despite the Cogelisk game only having one real cue, there were only 3 occasions when children could not articulate how they knew their answer was incorrect, and as many occasions where children identified the lack of a positive outcome cue as helping them to understand that they had made an error (e.g. "this was incorrect because when it's correct this [cog shaft] go down"). This suggests that both the game's feedback design and the children's familiarity with game mechanics combined to communicate outcome feedback.

No occasions were found were a child articulated more than two cues that helped them understand the outcome of their actions, despite their being 6 available cues in the Perilous Paths game. Two cues (the actions of the sphinx and the loss of gems) were not mentioned at all in the context of errors (although gaining gems was mentioned once in the context of getting the right answer). Taken together, this suggests that children were focused on the visual cues in the central area of the screen where the exercise was taking place (the word on the bridge turning red and then the bridge breaking) rather than the periphery of the screen (the sphinx in the top centre and the gems in the bottom left corner). Additionally, children identified either visual cues or verbal cues to explain their understanding, but not both together. The only exception was one participant who described the lack of a visual indicator ("because it doesn't turn green") in addition to the verbal cue ("the girl says try another time, you made that incorrect"). It seems probable that for children already undertaking the cognitively demanding task of playing an educational game in a foreign language and explaining their actions in a foreign language only the most salient cues were worth the effort to describe, and describing different modes of feedback at the same time was particularly challenging. It is difficult to disentangle failure to notice particular cues from the inability to articulate every noticed cue with the language and cognitive resources they had available.

Four of the eight students reported noticing the verbal elaborative feedback - representing 6 out of 16 possible opportunities. In each of these occasions, they described the metalinguistic 'hint' rather than the repetition of the selected answer. Given that the selected answer was repeated for both correct and incorrect choices, it seems likely that this was an unhelpful cue for determining the outcome of their choice, and thus not considered by the children to be feedback.

Unlike the outcome feedback, where not being mentioned may not necessarily have meant not being noticed, there is some evidence that the elaborative 'hints' were genuinely not noticed by participants. Two children, when asked if the game gave them any help in finding

the correct answers did not simply fail to mention hints, but actively said they had not received any hints even though they had. One of these even described verbal outcome feedback but not verbal elaborative feedback ("the girl says it is incorrect but it doesn't give any clue"). Additionally, on several occasions children selected a new response while the elaborative metalinguistic feedback was being read aloud, suggesting the feedback was being ignored.

***RQ2– When children attend to it, do they process elaborative feedback?***

We now focus on the total of 6 errors during which children reported noticing (hearing) the elaborative feedback. On 3 of these occasions (50%) the child reported not hearing the hint clearly. One child articulated a wish for a hint button, where the elaborative feedback could be played or replayed if the child is stuck or did not hear the hint the first time. Only two children could accurately recall what the feedback said and described it as helpful. Of these, one also described a trial-and-error processing, saying she had known it was one of three answers, and when the first two were incorrect she simply moved to the third. This partially undermines her description of the elaborative hint as 'useful' as, due to the game design, she did not receive the hint until after her second mistake when she presumably already had the correct answer in mind. These findings show that children are not strategically using elaborative feedback to correct their errors.

While the participants rarely reported noticing and using the elaborative hints, they still recovered from their errors after 10 of the 16 times elaborative feedback was given, choosing the wrong answer only 3 times following elaborative feedback and having only the possibility of choosing the correct answer after the other 3 pieces of elaborative feedback. This percentage (61% recovery rate) is only slightly higher than the 7 out of 14 (50%) recovery rate from outcome feedback alone. When describing their self-correction strategies, they generally described narrowing down the options with their explicit grammar knowledge, then trying out the remaining options mentally (e.g. "Because 'much' and 'many' mean 'a lot' and I think 'much' is good with 'sugar'. I figured out by myself, I didn't have any hint.")

### 4.8.3 Summary

*Did children attend to outcome feedback more so than elaborative feedback?*

Our findings show that in the presence of both outcome and elaborative feedback during an error EFL readers tend to attend and use the former as input for their next action. There was evidence that some students took advantage of explicit metalinguistic feedback, but the majority was ignored.

*Which cues in particular draw children's attention to the outcome feedback?*

Only a subset of cues were salient in helping draw the children's attention to the feedback. The most prominent were visual cues in the centre of the playing area, where the exercise was taking place - the colour change of the response and the movement of the platform (bridge or cog shaft). The next most described cue was audio feedback, where the game narrator told the child they were incorrect. Other cues (e.g. losing gems or sphinx emotions) were rarely noticed. It is suggested that where there are multiple cues with the same meaning, children will focus on those where they already have their attention directed - listening to the instructions of the game or looking at possible choices to select. This may be due to the cognitively demanding environment, with images, text, spoken text, sounds, music, and foreign language exercises all concentrated in one setting, children may not have the cognitive resources available to go searching for less salient cues. This calls for further

scrutiny of which cues may offer the most value to children's learning and motivation than others and suggests that careful game design is needed to situate these cues in a way that they are likely to be noticed.

*Did children understand how to action the elaborative feedback?*
Though the data set is small on this topic, it does not appear that the majority of the children took advantage of the elaborative feedback. The reasons for this included not noticing the hints, not being able to hear or process the hints, impatience with having to wait for the hints to continue playing, and using personal self-correction strategies rather than relying on explicit metalinguistic feedback. Further research is needed to investigate ways of increasing the salience and comprehensibility of elaborative feedback, without 'punishing' the player by forcing them to stop playing the game while they wait for the hint.

The rate of error recovery was slightly higher after elaborative feedback than pure outcome feedback (50% versus 61%), but with the small data set and the fact that many of these recoveries were at the point when the remaining choices had been reduced by multiple previous incorrect guesses, these numbers cannot be claimed to be significant. A study with a considerably larger dataset could be used to establish whether these findings are generalisable. It may be the case that some students lacked the ability to analyse and/or express their cognitive processes, and future work could additionally pursue the question of whether elaborative feedback has an impact on the child's understanding through an experimental study that varies the presence of feedback to examine its impact on child performance, or the use of eye-tracking software to track attention without requiring articulation.

## 4.9 Summary and Conclusion of Game Studies

**Children are aware of their performance**

Across the five studies all of the children were aware they had made an error. Therefore, all six Navigo game activities (Anubrick, Remove the Runes, Perilous Paths, Crocotiles, Cogelisk, Watch your step) were effective in communicating to children the outcome of their performance. In line with this, in each of the studies reported, there was a consistent finding that children attended to the outcome feedback, which was mainly visual. Most often, children noticed the red colour of the word, followed by environmental changes in the game e.g. bridge breaking. Generally children did not attend to the jewels they lost as a result of their error. It is important to reflect that the cues attended to were mostly presented in the centre of the screen area, which may have drawn more attention. Moreover, across the studies, children usually focused on up to two cues, despite the availability of more cues especially in some of the games available e.g. Perilous Paths. This could suggest that children have limited cognitive resources to attend to the entire cues gamut and therefore are able to attend to part of the game information available in the game (also in Johnson et al., 2017). Given children's partial attention to the visual cues, further research could identify which cues are the most informative to the children's learning toward calibrating future game design choices. Our studies also highlight that children may interpret their game performance in different ways depending on the cues they each attend to. Finally, there was a smaller group of participants who were not able to articulate how the game informed them about their performance, a finding which we will return to later as part of our methodological reflections.

**Attention to elaborative feedback was limited**

With regards to the elaborative feedback, a high number of children across the five studies reported not hearing the verbal feedback available in the games. A couple of children suggested having a replay button for the hint, providing a concrete recommendation for future improvements to Navigo. This observation also casts some doubt to Johnson et al's (2017) proposal that during visual tasks, as were our game activities, verbal feedback is most likely to be salient. Moreover, consistently across all studies, a few children were hindered by their ability to act in the game (choose their next response) while the verbal feedback was delivered, though we note that this was not prevalent. Future game design could examine disabling actions during verbal feedback, whilst also recognising that this may disrupt the flow and experience of the game. Finally, in those games that presented repetition feedback (i.e. the wrong choice was voiced out) this was not noticed by any of the children suggesting that this type of feedback may not be helpful.

**Processing of elaborative feedback was limited**

Our findings indicate that a small minority of children seem to benefit from elaborative feedback. The most notable example of this came from the English struggling readers, which consisted of two out of twenty-six children who were able to relate the feedback to their game response. From the remaining children who reported hearing the elaborative (verbal) feedback, many were not able to reshare what the feedback said and some children explicitly expressed their lack of understanding with regards to the content delivered in the feedback. Importantly, this result seemed to be consistent irrespective of the complexity and length of the feedback (in the English-struggling readers study there were two games that varied this dimension and yet produced the same finding). We note that there may be different underlying reasons for children's lack of understanding in each of the groups involved. For example, despite prior instruction, children may not have secured the metalinguistic knowledge required to understand the feedback without additional support. In the case of EFL in particular, children may require explicit links to their first language. In line with this, some of the Swedish EFL children referred to the level of their L2 language skills to explain why they couldn't understand the elaborative feedback.

Navigo addresses a diverse age range and set of learner profiles, which is beneficial from a commercial perspective since it offers different opportunities for exploitation. Given the large range of game activities available within Navigo (e.g. starting with 1,000 game activities), the question of whether feedback can be adapted to each learner profile brings with it both design and practical challenges. During the design phase we sought to take these issues into account, while addressing the technical requirement of having one verbal elaborative feedback per feature/game combination. Though the Innovation focus and scale of the iRead project did not allow for an iterative research-oriented design, future research could apply a design-based research approach to examine how feedback for each group of learners should be designed to aid understanding through several cycles of iteration. Moreover, previous work has recognised the importance of both intrinsic and extrinsic instruction around games (see Benton et al., 2019). In terms of extrinsic support, our findings show there is scope for teachers to explain the feedback to the learner in order to further support their understanding of the information included.

Finally, we observed that some of the children who were not able to identify any visual cues expressing the outcome feedback paid attention to the verbal elaborative feedback. However, instead of attending to the information embedded in the elaborative feedback, the presence of a verbal cue was interpreted as outcome feedback informing the child of the response correctness. This observation highlights the variable ways in which learners may interact with the instructional elements of a game.

**Action and performance after elaborative feedback**

Across the five studies, in three the studies involving the older range of children (Struggling Readers English and EFL – Swedish/Spanish), we determined the recovery rate of the children after they had received the elaborative feedback. Benton et al (2019) reported on a game study with young children (Years 1/2) who were unable to progress past their error in a commercial literacy game offering outcome feedback about half of the time. In contrast in this work, after the child had listened to the elaborative feedback, recovery rates ranged from 60-82% upon the second try. Unlike the study by Benton and colleagues which showed a clear preference on the part of children to resolve the error through 'trial and error' and 'experimentation' strategies, children of the present study employed 'stop and think' to reconstruct the meaning of the sentences they were working towards. While very few children took cues from the game to circumvent the learning aim (e.g. choosing a response whose length seemed to better fit in the gap), most of the children shared a set of deliberate strategies such as using their grammar and comprehension skills to re-think their response. Therefore, the game activities engaged this older group of children in deliberate learning strategies.

**Methodological reflections**

In seeking to understand how children interpret feedback it was necessary to use a verbal method. In the context of this method, in all of the studies, we found it challenging to base our interpretations on numerical data and to take children's verbal statements at face value. In the context of EFL it seems probable that for children already undertaking the cognitively demanding task of playing an educational game in a foreign language and explaining their actions in a foreign language only the most salient cues were worth the effort to describe, and describing different modes of feedback at the same time was particularly challenging. It is difficult to disentangle failure to notice particular cues from the inability to articulate every noticed cue with the language and cognitive resources they had available. Similarly, children with dyslexia and novice readers are still developing their metacognitive skills – requesting them to explain how they used elaborative feedback to inform their learning may have been difficult to articulate. Future work can additionally pursue the question of whether elaborative feedback has an impact on the child's understanding through an experimental study that varies the presence of feedback to examine its impact on child performance. This can shed light on whether the recovery rates we observed were due to children's independent learning strategies or due to children 'taking the hint', i.e., basing their action upon the feedback.

# 5 Implementation Phase: Appropriation study

## 5.1 Rationale for study

In the implementation phase, we are focusing, firstly, on how the iRead tools are being used, or appropriated, in schools as part of the curricular teaching and, secondly, on dissemination opportunities outside the school context. In the Appropriation study, begun in late October 2019, we are focusing on understanding appropriation and scaling of the Amigo/Navigo tools in a qualitative way. This phase started with a preparatory intervention where the researchers helped the teachers and students to develop the necessary autonomy. We are now in the phase where the researchers leave it to the teachers to implement the components in their own context, and monitor their use. All products and services developed in the iRead project are integrated in this phase.

### School use

Harrison et al. (2007) argue that when designing technological artefacts, the study of the local, situated practices of the users should be the focal point, since meaning is created in the context and situation, often in collaboration between the people, the artefact and the environment as well as the resources available where the artefact is used. Because of the situated nature of use, many technologies are not used in the ways designers had originally envisioned. However, according to Dix (2007) 'these improvisations and adaptations around technology are not a sign of failure, things the designer forgot, but rather show that the technology has been domesticated, that the users understand and are comfortable enough with the technology to use it in their own ways' (p. 27). This phenomenon is called appropriation. In addition to the situatedness of the technology, Dix also points to two additional advantages of appropriation: dynamics and ownership. Over time, environments and the people in them change, and most likely so does their use of technology. A design for use must therefore be a design for change [2]. Appropriation can also create a feeling of ownership, as the users feel that they are in control or find new ways to achieve their goals.

The Model of Technology Appropriation (Carroll, 2006; Fidock & Carrol, 2006) was developed to show the appropriation process from Technology as Designed to Technology in Use (Figure 5.1).

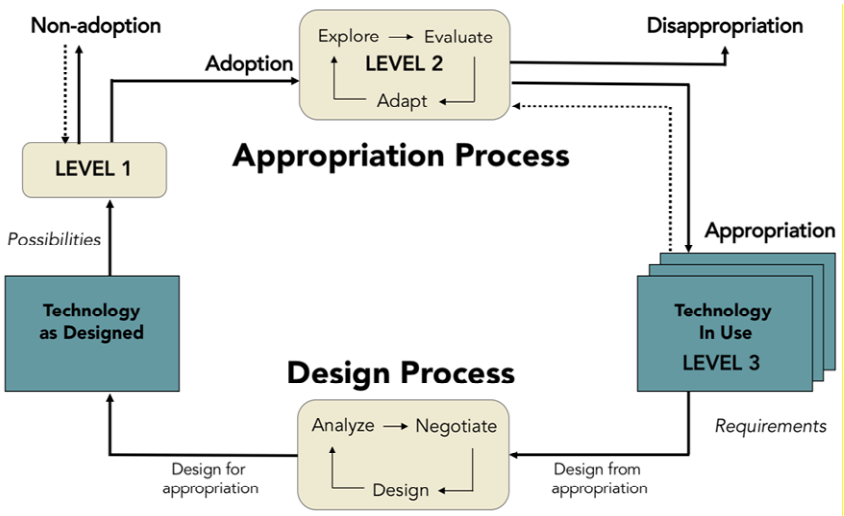



**Figure 5.1.** Model of Technology Appropriation

In this process, users evaluate the technology at three different levels:

- Level 1: At the first level they consider the technology **as originally designed**, based on its features and their own expectations of its value. At this level users may even reject the technology for a variety of reasons, such as a lack of technical skills, a lack of equipment etc.
- Level 2: At the second level, users **continuously explore and evaluate the technology as they use it and learn how it can support their practices**. As technology may enable or constrain certain activities, users change their activities to fit with the technology. In addition, depending on the malleability of the technology, users **try to adapt it to fit with current needs, or for completely new purposes**. During this stage, there are a number of influences that encourage or discourage continued appropriation. Three elements are needed to understand appropriation (Bruce et al. 2009):
    - The idealisation serves as an indication for the intentions of the developers as they often are important participants throughout the creation of the technology. Further, this element is used to identify how the technology is perceived or anticipated by the teachers.
    - The settings form an important part in how a technology emerges and considers aspects about the social context of use, i.e. cultural, institutional, and pedagogical aspects. This includes the goals and expectations of the participants, the institutional practice, constraints, and resources.
    - The realisation of the technology in each distinct context aims to study how the innovation is used, how the use changes and the reason for these changes.
- Level 3: If users do not reject the technology at level 2, the third level may be reached over time. At this level, the **technology has become an integral part of the users' practice**, and no further adaptations take place. However, this may change if the users' evaluation of the technology changes, in which case they return to the previous level where the technology may once again be rejected.

## Research Questions

The following main research question with underlying sub questions will be answered.

RQ1: What are the facilitative mechanisms to appropriation and how does this foster scaling?

- How does CPD and other modes of support within and across schools scaffold teachers in the process of appropriation?
- What challenges remain that cannot be addressed through these mechanisms?
- How does it inform our understanding of scaling within and across schools?

RQ2: How does the nature of appropriation develop over time?

- Is appropriation aligned with the conceptual underpinnings of technology (match between the idealisation and the realisation)?
- What contextual factors (settings) shape appropriation, for what ends, and who benefits?

## CPD

The design of the teacher support component was carried out collaboratively with teachers from January until May 2019. Outcomes of this formed a set of learning designs for the apps, a manual that describes the technology and how it works, and a set of face-to-face CPD workshops run in June, July, September and October 2019. We are also prepared to run periodic CPD workshops to address problem areas teachers report to us as they begin to use the technology, either face-to-face or online via recorded webinars. Additionally, depending on teacher feedback, we may implement a teacher mentorship programme where the researcher works more closely with the teacher, through planning support, lesson demonstrations and/or providing specific technical support during lessons. These activities will be boosted upon teachers' requests, and reduced when teachers gain more confidence. It is within this context that we will explore appropriation.

## Research Design

With the goal of investigating how the iRead technologies may be scaled up, the aim of the appropriation study is to investigate how the technologies are being implemented and appropriated in the participating schools. The study takes the teachers' perspective, and focuses on how they choose to include the technology in their classrooms. The results will offer opportunities to un-pick the context of the appropriation, and shed light on how the technology scaled up, why it has become successful in some schools and why not in others. The appropriation study aims to investigate the main research question with underlying sub questions (cf. D9.1_evaluation plan).

All products and services of iRead (e-Reader, Navigo game, learning analytics and teacher tools), as well as the CPD were made available to the teachers. In this qualitative study, all teachers who were willing to use the iRead products and services in their teaching were first offered CPD, with the researchers helping them to set up their teaching in a way that fits their context. Once the teachers felt confident to start working more independently, the researchers stepped down, but continuously offer regular support to tackle problems to keep the teachers going.

### *Participants*

All partners have found teachers who are willing to participate with their classes. The maximum number of teachers and children each partner was able to recruit for the study, was dependent on the number of tablets available and whether children can share tablets, and meant that there are several classes in the same school that can use the tablets at different times.

### *Data Collection*

The appropriation study will run during the period November 2019 - June 2020, with a minimum period of 10 weeks per school. Given that each participant has a fixed number of tablets, it could be necessary to restrict the time that each school use the tablets to be able to reach the number of students required for each participant. Participants will be asked to provide a justification for the length they decide on for the study.

An overview of the methods to be used in the appropriation study includes the following:

- **Descriptions of the schools** to provide contextual information.

- Semi-structured **interviews** with each teacher will be conducted using an interview guide (suggested duration 45 minutes/interview). The interviews must be *audio recorded* with the teachers' *informed consent* to allow for *transcription*.
- **Questionnaires**, e.g. using Google Forms, will be used to *supplement interviews* with the teachers.
- **Classroom observations** comprising *a case study* which will include (at least) *two contrasting schools* which differ from one another (e.g. differing in the amount of exposure to the Amigo Reader and the Navigo games, or how many of the teachers in the school use the apps in their teaching, for example All or almost all teachers, Half of the teachers, One teacher)
- **Log data** to *supplement the qualitative data* (logs and analyses will be provided by NTUA – see D4.6)

Depending on the resources available and duration planned for the study, participants may choose a *minimal study set-up* approach or a more *advanced study set-up* to conduct the appropriation study (see T6.1).

## 5.2 Partner progress

Table 5.4 reports partners' progress to date with the appropriation study. From Section 5.2 onwards we report descriptive information about the schools involved in each pilot.

***Table 5.1 – Partner progress***

| | **CPD – training sessions** | **Data Collection/Analysis** | **Deliverable report** |
|---|---|---|---|
| **EFL** | | | |
| Sweden (UGOT)<br>Schools=7 | Completed for batch 1[1]<br>Ongoing for batch 2 | Ongoing | December 2020 |
| Greek (BC)<br>Schools=2 | Completed for batch 1<br>Ongoing for batch 2 | | |
| Romanian (ULBS)<br>N=6 | Completed | | |
| Spanish (UB)<br>Schools=7 | Completed | | |
| **Novice Readers** | | | |
| English (UCL)<br>N=8 | Completed | Ongoing | December 2020 |
| Greek (Doukas)<br>N=21 | Completed | | |
| Spanish (UB)<br>Schools=7 | Completed | | |
| German (DHBW)<br>N=9 | Completed | | |

[1] UGOT and BC are involving schools in two waves. This decision was made in order to meet their projected student numbers.

| Struggling Readers | | | |
|---|---|---|---|
| English (UCL) N=8 | Completed | Ongoing | December 2020 |
| Greek (UOI) N=6 | Completed | | |

## 5.3 School Descriptions

### 5.3.1 Struggling and Novice Readers – UK (UCL)

#### Kings Cross Academy

Kings Cross Academy is an inner city, mixed primary school that opened in September 2015. It is a two-form entry academy school that is sponsored by the King's Cross Academy Trust, formed by the King's Cross Central Limited Partnership (KCCLP). As of May 2018, there were 206 pupils on roll. As its pupil intake grows, it is expected to expand with places for 420 primary school pupils aged 4 to 11, plus the nursery. It currently has two form entry per year group with 60 pupils in each year from nursery class through to Year 4. The school is co-located with Frank Barnes School, a specialist school for Deaf children.

The school's latest Ofsted inspection reported that the proportion of pupils who have special educational needs and/or disabilities is above UK national average. The proportion of pupils known to be eligible for support through pupil premium funding is below the UK national average. Pupils are from a wide range of different ethnic backgrounds and almost half of the pupils speak English as an additional language. There are no pupils in the early stages of learning English. The school was rated as 'good' in its first Ofsted inspection in May 2018.

Currently, there are 133 pupils involved in the iRead study, 117 beginning readers from years 1 – 3 and 16 struggling readers from year 4. These pupils are supported by five teaching staff. Researchers and school staff began working together from October 2019. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was insufficient for supporting their daily school needs, as well as the additional internet requirements posed by the iRead technologies. This issue was resolved in November 2019 where the bandwidth was reported to be drastically increased from 50mbps to in excess of 300mbps. There is no locally-identified IT support within the school, although the school literacy lead and Year 4 teacher is the iRead contact who has been working with iRead researchers to address internet connectivity and storage solutions. The tablets are stored within a lockable technology server room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

#### Jubilee School

Jubilee school is an inner city, mixed community primary school located in London. It has 438 pupils registered on the school roll with two form entry across nursery, reception and years 1-6. Each class has approximately 30 pupils. The school is co-located with a visually impaired unit.

Jubilee school's latest Ofsted inspection reported approximately three-fifths of the pupils speak a language other than English as their first language. Thirty-one different languages are

spoken and one in five pupils is at an early stage of learning English. The report also identified that nearly two-fifths of the pupils have special education needs, much higher than the UK national average. The school is located in and serves a community that contains areas of high deprivation. Over half the pupils are entitled to free school meals. The most recent Ofsted inspection in November 2007 judged the school as 'outstanding' which meant that routine inspections have not been undertaken since.

There are 13 pupils involved in the iRead study, supported by two teaching staff. The participating pupils have been identified by the school SENCo as struggling readers, owing to not passing the end of year 1 phonics test. These pupils are currently in years 3 and 4. Owing to the small number of participating pupils, tablet charging and storage is straightforward and managed by the two participating staff members who individually charge tablets overnight and store these in a secure area within the classroom. The school has onsite IT support who has liaised with iRead researchers about connectivity arrangements and privacy controls. The internet connectivity speed in school is currently sufficient, but being monitored to ensure that the apps are able to fully run.

## Eleanor Palmer School

Eleanor Palmer School is a mixed, inner city community school in London. It has one form entry and was described as 'an average sized' school at its last Ofsted inspection in October 2011. There are approximately 30 pupils in each class, ranging from nursery class through to year 6.

Half of the pupils in the school are described as being from ethnic minority backgrounds although few are at the early stage of learning English as an additional language. Fewer pupils than the UK national average are described as having special educational needs and/or disabilities. The proportion of pupils known to have free school meals is described as 'average' compared with the national average. At the last Ofsted inspection in 2011, the school was judged as 'outstanding'.

There are 100 pupils taking part in the iRead evaluation study. These are formed of 83 beginning readers in years 1-3 and 17 struggling readers in years 4-6. They are supported to take part by 8 teaching staff. There are no reported issues with the school wifi internet connectivity. The tablets are stored in the lockable photocopy room when not in use, in plastic storage boxes. The school are using 30 iRead tablets and charging these through a combination of individual chargers and 10 port USB chargers.

## Stormont

Stormont school is an independent girls day school located in a suburban town on the outskirts of London. It is a registered charitable educational trust, administered by a board of governors. There are 149 pupils on school roll in classes from reception through to year 6.

The majority of pupil are from white British backgrounds of families with professional and business backgrounds. A recent inspection by the independent schools directorate in November 2017 identified that there are also many other ethnic groups represented within the school. The school's nationalised test data revealed that pupil ability is above average. Of the 149 pupils, the school has identified 13 pupils with special educational needs and/or disabilities (i.e. 9%), these include pupils with dyslexia or speech and language difficulties. Six

pupils have English as an additional language. There are no reported pupils with pupil premium support.

There are 28 pupils participating in the iRead study, supported by two teachers. All children are described as struggling readers. The school is using six tablets with these pupils in small group work, out of the classroom. Owing to the small number of tablets, charging and storage is more straightforward. The tablets are stored and charged individually in the school inclusion room.

### Grafton

Grafton school is a mixed community, inner city school in London. There are 458 pupils on school roll with two form entry from nursery class through to year six. The school is described as 'larger than most'. There are approximately 30 pupils in each class.

At the last Ofsted inspection in November 2008, the school was judged as 'outstanding'. There have been no further routine full inspections since. The Ofsted inspection reported that standards are above UK national average and pupil achievement is outstanding. The school is rated as being in the top 1% of schools in the country for the progress that pupils make in English, mathematics and science. Over 80% of all pupils come from ethnic minority backgrounds. Over half of all pupils are learning English as an additional language. The proportion of children with special educational needs and/or disabilities is described as 'very much higher than the UK national average', according to the last Ofsted report. The proportion of pupils who are eligible for pupil premium free school meals is higher than the UK national average.

There are currently 59 pupils who are participating in the iRead beginning readers study, all from year 3. There are plans to shortly involve an additional 35 pupils who are struggling readers from years 4-6. The tablets are able to connect to the school wifi with no reported issues. There are 30 iRead tablets being used. These are stored in a lockable drawer in the inclusion room and charged overnight on multiport charging sockets that were sourced partly through school, partly by the iRead project.

### St Elizabeth's

St Elizabeth's Catholic Primary is a maintained, inner city mixed school. There are 438 pupils on school roll with two form entry. Each class group has approximately 30 pupils in each class.

The school's most recent Ofsted inspection in February 2017 reported that the proportion of pupils from minority ethnic groups and the number of pupils who speak English as an additional language was much higher than the national average. The proportion of students with special educational needs and/or disabilities was also reported to be above the UK national average. The school has a higher than average proportion of students who receive a pupil premium for free school meals as well as there being a higher than average proportion of children who are looked after by the local authority. At the schools last Ofsted inspection, the school was judged 'good'.

There are currently 156 pupils taking part in the iRead evaluation study, currently supported by approximately 15 staff members. Of these pupils, 121 are described as beginning readers from Years 1-3 and 35 pupils described as struggling readers from Years 4-6. In the early stages of the evaluation study, the main priorities have been to establish an effective storage and

charging solution for the tablets, owing to the high number of tablets being used across the school (i.e. 60 tablets). The school has sourced a storage cabinet and the iRead team have provided multi socket charging stations. As it has been difficult to source additional accessories via the school, the iRead team have planned to fund headphones and a padlock for the cabinet. Staff training has also been an ongoing priority. Following the initial whole school CPD session for 45 staff members, small group and individual training sessions continue to be delivered so that staff members are confident in using the technologies. The school internet connection is sufficient for loading the apps and playing games, however the low download/upload speed is being monitored and may potentially pose challenges when further app updates are needed.

## Yerbury

Yerbury primary school is a mixed, community school in inner city London. There are 460 pupils on school roll with two form entry from nursery and reception classes through Years 1 – 6.

Yerbury school was judged as 'outstanding' at the last Ofsted inspection in July 2009 and owing to this rating, has not had a full inspection since. Pupils are reported to come from a wide range of ethnic backgrounds. Fifteen percent of pupils speak English as an additional language and there are 27 different languages at home. There are very few pupils described as beginning English learners. The proportion of pupils with special educational needs and/or disabilities is below the UK national average, however of this proportion, the most common area of learning difficulty is dyslexia.

There are 21 pupils participating in the iRead study, from Years 3-6. All of these pupils are described as struggling readers and are supported by approximately 9 staff members. Owing to these numbers, the storage and charging arrangements have not been an issue for the five iRead tablets. The internet connection in the school is good with sufficient internet download/upload speeds for updates and using the apps.

## Cayley

Cayley Primary school is a mixed, inner city community school in London. There are 543 pupils on school roll with three form entry from nursery and reception classes, through Years 1 – 6.

Cayley school is described as much larger than average in size. At the last Ofsted inspection in June 2012, it was reported that the proportion of pupils who speak English as an additional language is well above the UK national average with most pupils being of Bangladeshi heritage. Many pupils who join the school are at the early stages of learning English. The proportion of pupils who have special educational needs and/or disabilities is broadly average. The most recent Ofsted inspection judged the school as 'good'.

There are 270 pupils participating in the iRead study across Years 1 – 3. These pupils are described as beginning readers and supported by approx. 15 staff members. The iRead set up for Cayley school has been later than most schools owing to delays in scheduling the CPD training for staff and establishing consent from parents and carers. The school has been issued 60 iRead tablets and it has been agreed that these will be stored and charged in a lockable office that is accessible to all classes taking part. The school was issued with one multiport charging adaptor and is funding additional adaptors as well as headphones. There are no

reported issues with the internet connectivity and the iRead team have worked with the school IT support to ensure the tablets can successfully connect to the internet.

### 5.3.2 Struggling Readers – Greece (UOI)

Only public schools from Ioannina took part in the evaluation. Children aged between 5,8 to 11,6 years old attend primary schools in Greece. No locally-identified IT support exists within public schools although all schools have wi-fi access to the internet, since by law (13126/Λ/2-2-2011) all public schools in Greece must provide internet access through the Hellas school network.

#### Katsika primary school

Katsika primary school is a rural, primary school in a village named Katsika (3.885 citizens), near Ioannina. The school was established in September 2015. As of September 2019, there were 180 students on roll and 34 teachers. Currently, the school has a two-form-entry per year group with 30 students in each year from first class through to Year 6.

Students are from different ethnic backgrounds but they are all speakers of Greek. Currently, there are 6 students involved in the iRead study, 3 struggling readers from year 4, 2 in year 5 and 1 in year 6. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Since October 2019, researchers and school staff started collaborating. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was sufficient for supporting the requirements posed by the iRead technologies. The tablets are stored within a lockable room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

#### Koutselio primary school

Koutselio primary school is a rural, primary school in a village named Koutselio (1118 citizens), 10 km south of Ioannina. This school was established in 1932. As of September 2019, there were 80 students on roll and 15 teachers. Currently, the school has a single- form-entry per year group with 13 to 16 students in each year from first class through to Year 6.

Students are from different ethnic backgrounds but they are all speakers of Greek. Currently, there are 3 students involved in the iRead study, 2 struggling readers from year 4 and 1 in year 5. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Since October 2019, researchers and school staff started collaborating. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was sufficient for supporting the requirements posed by the iRead technologies. The tablets are stored within a lockable room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

#### 1st primary school of Anatoli

1st primary school of Anatoli is a primary school in the suburbs of Ioannina, named Anatoli (9.798 citizens). The school was established in September 1970. As of September 2019, there were 360 students on roll and 45 teachers. Currently, it has a three-form-entry per year group with 60 students in each year from first class through to Year 6.

Students are from different ethnic backgrounds but they are all speakers of Greek. Currently, there are 7 students involved in the iRead study, 3 struggling readers from year 4, 2 in year 5 and 2 in year 6. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Since October 2019, researchers and school staff started collaborating. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was sufficient for supporting the requirements posed by the iRead technologies. The tablets are stored within a lockable room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

### 3rd primary school of Anatoli

3rd primary school of Anatoli is a primary school in the suburbs of Ioannina, named Anatoli (9.798 citizens). The school was established in September 2001. As of September 2019, there were 300 students on roll and 42 teachers. Currently, the school has a three-form-entry per year group with 50 students in each year from first class through to Year 6.

Students are from different ethnic backgrounds but they are all speakers of Greek. Currently, there are 2 pupils involved in the iRead study, 2 struggling readers from year 5. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Since October 2019, researchers and school staff started collaborating. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was sufficient for supporting the requirements posed by the iRead technologies. The tablets are stored within a lockable room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

### 21st primary school of Ioannina

21st primary school is a primary school in Ioannina. The school was established in September 1972. As of September 2019, there were 250 students on roll and 28 teachers. Currently the school has a two-form-entry per year group with 40 to 45 students in each year from first class through to Year 6. It has a total of 13 classrooms, 1 lecture hall, 1 integration department, an event room, a physics lab and a chemistry lab.

Students are from different ethnic backgrounds but they are all speakers of Greek. Currently, there are 4 students involved in the iRead study, 2 struggling readers from year 5 and 2 from year 6. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Since October 2019, researchers and school staff started collaborating. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was sufficient for supporting the requirements posed by the iRead technologies. The tablets are stored within a lockable room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

### 27th primary school of Ioannina

27thprimary school is a primary school in Ioannina. The school was established in September 2005. As of September 2019, there were 325 students on roll and 47 teachers. Currently, the school has a two-form-entry per year group with 50 to 60 students in each year from first class through to Year 6.

Students are from different ethnic backgrounds but they are all speakers of Greek. Currently, there are 7 students involved in the iRead study, 4 struggling readers from year 5 and 3 from year 6. At the time of the study children were receiving specialist literacy provision in small groups outside of the mainstream classroom. Since October 2019, researchers and school staff started collaborating. In these early stages of setting up the technologies, it was identified that the school existing internet bandwidth was sufficient for supporting the requirements posed by the iRead technologies. The tablets are stored within a lockable room overnight with access to multi-port charging points. They are stored in tablet baskets that have been sourced through the school.

### 5.3.3 Novice Readers – Greece (Doukas)

As the novice Greek pilot occurs in 21 schools with more than 800 students and 52 teachers, we will not describe in detail the schools. One of the reasons that we are not describing each school separately is that they all public schools (except Doukas School) and they follow the same curriculum. We have divided the schools into five groups, mainly based on their location and we mention those parts that some school differentiate from others.

We grouped the public schools from Athens in three large groups:

- West Attica (6 schools)
- East Attica (3 schools)
- North Attica (6 schools)

The other three groups are:

- Schools from Thessaloniki (3 schools)
- Regional Schools (2 schools)
- Doukas School (private school)

#### West Attica

Schools from West Attica participating in the pilot testing of the iRead applications are: 13th Primary School of Peristeri, 14th Primary School of Peristeri, 21st Primary School of Peristeri, 30th Primary School of Peristeri, 33rd Primary School of Peristeri and 39th Primary School of Peristeri. They are all public schools and they follow the same curriculum given by the Greek Ministry of Education.

The public schools do not have an IT support department, Wifi issues are solved by the school's director. Those schools have almost the same number of students and in a proportion from 2% to 4% they have children with learning disabilities.

Schools of west Attica have all the 6th grades of primary school and each grade is divided in two to three classes. Each class is composed of 19 to 23 students.

As for the iRead project below you will find a table with the number of students and teachers from each school.

| School Name | N° of Teachers | N° of students | Grades |
|---|---|---|---|
| 13th PS of Peristeri | 2 | 40 | 2nd, 3rd (Year 1, Year 2) |

| | | | |
|---|---|---|---|
| 14th PS of Peristeri | 2 | 31 | 2nd,4th (Year 1, Year 2) |
| 21st PS of Peristeri | 2 | 37 | 3rd (Year 2) |
| 30th PS of Peristeri | 3 | 51 | 4th (Year 2) |
| 33rd PS of Peristeri | 1 | 19 | 2nd (Year 1) |
| 39th PS of Peristeri | 3 | 48 | 3rd, 4th (Year 2) |

All those teachers participated in CPD, held at Peristeri and the project was welcomed with enthusiasm. During the first stages of the pilot testing they faced some important, mainly technical, issues. Firstly, the 21st PS of Peristeri could not log in Navigo Game as the Wifi signal was not strong enough to support the game. In order to face this problem they asked from the municipality to change the internet cables to optical fibers. Another main issue was the storage. All schools along with the responsible for Novice Greek Pilot testing (Doukas School) discussed and decided to keep the tablets in the director's office in each school so as to be safe. Doukas School asked if those storages can be locked in order to guarantee their security. Most of the schools followed our suggestion.
Moreover, as most schools faced problems with the sound, they could not listen to the instructions given by the game, two of the schools decided to buy headphones for their students.

## East Attica

In this category belong 3 schools (2nd PS of Lavrio, 1st PS of Palaia Fokaia and 1st PS of Pallini). Those schools are located in the suburbs of Athens. They are all public schools following the same curriculum as all other public schools.

The 1st School of Pallini acquires an integration class. Integration classes are created to help students with learning or other disabilities for a number of hours weekly. The integration occurs according to the importance and the stage of the problem. Moreover, those classes can be either 1:1 meetings or classes with a small number of children. The curriculum followed in these classes is in most cases different and adaptable to each child's problem.

In the following table you will find the numbers (teacher, students, grades) for each one of those three schools:

| School Name | N° of Teachers | N° of Students | Grades |
|---|---|---|---|
| 2nd PS of Lavrio | 3 | 86 | 2nd, 3rd (Year 1, Year 2) |
| 1st PS of P. Fokaia | 3 | 89 | 2nd, 3rd, 4th (Year 1, Year 2) |
| 1st PS of Pallini | 3 | 61 | 1st, 2nd, 4th (Year 1, Year 2) |

The schools in this area did not face any serious problems as they followed our suggestions about the storage and the charging. Again, as all the other schools, primary schools of East Attica do not have their own IT department. In one of the schools, the teachers bought Wifi repeater in order to increase the range of their network. Also in the 1st Primary School of Pallini, teachers had to change classroom due to Wifi connection problems.

## North Attica

Another group of schools that takes part in the pilot testing of the iRead applications are in the North Attica. The advantage of these schools is that they have easy access to Doukas

School (who is the responsible for Novice Greek pilot), as they are close enough in distance. Six schools are in this group: 1st PS of Psychiko, 11th PS of Chalandri, 1st PS of Likovrisi, 7th PS of Kifissia, 3rd and 5th PS of Agia Paraskevi.

Those schools have almost the similar number of students and each class consists of 19-23 students. The 1st PS of Psychiko is one of the public schools that has a psychologist. Parents and students who need help have the opportunity to visit her once a week and consult her. Moreover, the 11th PS of Chalandri has an equipped computer labarotory. One of the CPDs was held in this lab and the teachers from this area of Athens took part. The teacher, responsible for the laboratory is also a member teacher of the pilot and she proposed a list of everyday useful advices on how to use the tablets. Her article was published in the iRead project website. The most helpful aspect of this CPD is that Mrs. Skiadelli had already bought all the appropriate equipment and she showed participants examples on how to practically use them.

Below is the table that shows the numbers of teachers, students and grades for each of one of the schools:

| School Name | N° of teachers | N° of students | Grades |
|---|---|---|---|
| 1st PS of Psychiko | 2 (+1 english teacher) | 31 (+32 EFL students) | 4th, 5th (Year 2, Year 3) |
| 11th PS of Chalandri | 1 | 50 | 4th (Year 2) |
| 1st PS of Likovrisi* | Not yet defined | Not yet defined | Not yet defined |
| 7th PS of Kifissia | 4 | 53 | 2nd, 4th (Year 1, Year 2) |
| 3rd PS of Ag. Paraskevi | 2 | 40 | 3rd, 5th (Year 2, Year 3) |
| 5th PS of Ag. Paraskevi | 4 | 40 | 4th, 5th (Year 2, Year 3) |

*The 1st PS of Likovrisi did not yet provide us with data (students and teachers) due to changes in their management board.

During the 1st part of pilot (started in June), Doukas team visited the 1st PS of Psychiko and along with the teachers we found practical ways to storage and keep tablets safe. Also, we provided this school with usernames and passwords for EFL (NTUA gave us access to create those accounts).

## Schools from Thessaloniki

In this group there are 3 schools. Thessaloniki is the second biggest town in Greece and 3 schools are present at iRead novice Greek pilot testing. The first one is an experimental school and the other share the same building. Below, there is a detailed description of the 1st Experimental Primary School as it is a worth-mentioned case school.

**1st Experimental School of Thessaloniki:** The experimental schools in general are schools that promote the educational research. University students (in the case of this school, the researchers are students from the School of Primary Education from the Aristotle University of Thessaloniki) visit the school (in a certain semester of their studies) and conduct research on every educational field. However, those schools follow the curriculum that any other public primary school does. Every year these schools decide on the number of the students they will accept as students, in case when the number of students applied in the school are more than the expected, they are chosen by drawing.

The 1st Experimental School of Thessaloniki has two classes for every grade and the number of the students are 20 per class. The school does not have teachers or classes for children with special needs and less than the 2% of the students face learning disabilities, diagnosed during their studies.

The two other schools (4th and 15th Primary School of Kalamaria) share the same building. Both schools share a fully equipped computer laboratory (educational robotics, 3D printers etc) .

All the teachers were present at the CPD held at Thessaloniki. Teachers did not mention any problems while testing the applications. However, the 1st Experimental Primary Schools is being late at starting the piloting as they are moving to a new building, as the old one was deemed inappropriate.

Here is the table showing how many teachers and students has already being on the pilot testing:

| School Name | Nº of teachers | Nº of students | Grades |
|---|---|---|---|
| 1st Exp. School | 3 | 20 (more students will be added soon) | 4th (Year 2) |
| 15th PS of Kalamaria | 3 | 43 | 2nd (Year 1) |
| 4th PS of Kalamaria | 2 | 64 | 3rd, 4th (Year 2) |

## Regional Schools

**2nd primary School of Kavala:** This school's historical building was built between 1930-1935, in the east part of Kavala (a small town in northern Greece). The 2nd Primary School was founded in 1949 and has 212 students. Also, the school offers integration courses for refugees, teachers hired from the State so as to teach Greek to students that have little or no knowledge of Greek. There is a teacher for every 4-5 students in order to make it easier and faster to learn in order to be able to attend school. iRead application will also be used by those students.

In the iRead pilot testing two teachers take part. Also, there is one class for EFL students. In total 40 students test the application from 5th grade (Year 3 for the need of the project). Once the school received the tablets, they bought cases in order to protect them from damages.

**Primary School of Vivlos, Naxos:** The history of this school can be divided in three time periods. The first one is when Greece was under Ottoman control, the second one between 1837-1922 and the last one from 1922 until now. The school has only four teachers (all of them take part in the iRead pilot testing). That has as a result that two of those teachers have more than one grade. That make their lives and their work more difficult as they are supposed to teach all the expected curriculum during the school time.
The teachers were more than willing to apply iRead project considering that this will, also, help their work. In addition to this, more more refugees are visiting the island each year. Almost 15% of pupils are not Greek native speakers.

Due to distant issues the teachers could not attend the CPDs held in Athens and Thessaloniki, so we had a webinar where we presented the project, its aims and how to use them. Teachers from Naxos did not mention any problem during the piloting.

**Doukas School:** Doukas school is a private K12 school in Athens. In the primary school there are around 250 students. The school is located in northern Athens with a lot of facilities e.g. swimming pool, library. The educational programme in the Primary School is not only based on the guidelines provided by the Ministry of Education but also on our own Institutional Learning Goals Syllabus. This is the backbone of our instructional design. It includes lessons and various activities through innovative methodologies that make school creative, pleasant, useful and efficient. Moreover, each pupil from Grades 4-9, owns and uses their own Student Computer. This results in a more modern learning environment encouraging students to investigate and search for information and where teaching becomes individualised. In this environment activities are completed through teamwork and learning becomes more meaningful. The Student Computer in the classroom is used like an interactive book, an electronic notebook for organising one's notes, a tool with multimedia material, a self-assessment tool with open- and closed-type questions and for interdisciplinary work. It includes internal publications and all the books required by the Ministry of Education as well as foreign language texts and support material, educational software, etc.

Also, the primary school psychologist s present at the school daily. She coordinates the Mentoring programme, works closely with all our teachers, visits classes within the Life Skills programme for social and emotional development and is available to give parents personalised advice and guidance. The psychologist administers evaluation tests to identify learning difficulties and suggests ways to address the problem while, at the same time, ensuring the harmonious cooperation between school and family in these matters.

The iRead applications are used in a weekly basis in two classrooms (2$^{nd}$ and 3$^{rd}$ grade, Year 1 and Year 2 respectively). Partners from Doukas' Research & Development department are always present during the lesson helping and advising both students and teachers. The venue were the lessons are held is the library. The library as a classroom for iRead application has two advantages; the first one is the quality of internet connection and the second one is that children are more concentrated and quiet than in their class so that it is feasible to listen to the instructions and reply more carefully in the games.

### 5.3.4 Novice Readers – Germany (DHBW)

### Hebel Grundschule

The Hebel primary school is located in Karlsruhe's inner city west. It is close to the city and yet surrounded by greenery. Since the 2015/16 school year, the Hebel primary school has been an all-day school of choice and offers both full-day and half-day school attendance. The Hebel primary school shares the premises with the Hebel secondary school. In the immediate vicinity is the University of Education, which offers cooperation with the school.
Currently, 30 second grade children are participating in the iREAD study. These students are supported by 2 teachers. The employees of iRead and the teachers at the lever school have been working together since March 2019. The school has had a good WiFi network since September 2019 . At the beginning of the collaboration, the WLAN was made available by the employees of the iRead project via a mobile prepaid router . The tablets are stored in a

portable tablet box with a multi-USB port charging station in a lockable cupboard in the classroom. There is no local IT support in the school.

### European School Karlsruhe

The European School in Karlsruhe is the result of an innovative project that is supported by all EU countries. The school was founded in 1962 and has a long experience in the field of multilingual and multicultural education. Taking into account the potential and interests, the children in the European School will be encouraged in their linguistic, mathematical and creative skills . There are two German classes, one English class and one French class in the primary level.

The European School has a functioning WiFi network in the classrooms. There are currently 36 3rd grade children participating in the iRead project. The children attend the German class. Most children speak other languages (English, Arabic, Russian, Chinese). 10% of the children speak German as a second language and are in the early stages of learning German. 2 teachers support the children in the iRead project. The tablets are loaded in a portable tablet box provided by the project management and stored in the teacher's room. There is no internal IT support.

### GMS Eggenstein

The Community School Eggenstein is an all-day school. Currently visiting about 415 students at the primary level (grades 1- 4) and at the secondary level (grades 5-10) school. The primary school is an "open" all-day school. This means that parents can choose for each school year as full-day or half-day program. The school is characterized by individualized learning at different levels. Classes are competency-based with individual forms of learning and include individually tailored support measures with regular learning status diagnoses .
In iRead project 30 children participate in Grade 4 The children are looked after by two teachers. For the project, the WiFi - network was expanded, so that in the two classrooms of iREAD a good network is available for the project children. The tablets are stored in the tablet boxes in the classroom and charged via the multi-port connector.

### Anne Frank Gemeinschaftsschule

The Anne-Frank Gemeinschaftsschule is an all-day primary school. It has 4 classes per year. Parents of year 1 and 2 have the option to choose whether their child should be taught in a regular class or in a mixed class. 320 pupils are currently being taught in the primary area , of which 27 children are being educated and supervised by special educators. The students come from a variety of ethnic backgrounds. 5% of primary school children are in the early stages of learning German.

The community school offers all educational standards (secondary school, junior high school and high school. The community school offers a stimulating learning environment and a differentiated lesson design with phases of independent and cooperative learning. The school is based on both the performance principle and the principle of equal opportunities. A division of the students The Anne Frank Community School is an all-day school with an inclusive range of courses in which both children with and without disabilities learn together. In the iREAD project currently seven children of from grade 2 and 20 from Grade 4 are taking part in the

project. They are supported by two special educators and a class teacher. The Anne Frank primary school does not have a wifi network. The children participating in the iREAD project have to go to a specific classroom (learning studio ) to use iREAD . The tablets are also loaded and stored in this room. The school has internal IT support.

### Elementary school in Neunkirchen

The elementary school Neunkirchen is rural and has one classroom each for 1st-4th grade with rather small school classes of approx. 20 children per year. The students come from a variety of ethnic backgrounds. In the iREAD project currently seven children from first grade, 22 from the second grade, and the 14 from each of Grades 3 and 4 are participating. There is a teacher in each class. The school has an extensive wifi network. A separate access was created for the tablets. So the tablets can be used freely in every classroom. The tablets are kept in the staff room . The school does not have internal IT support.

### Viktor von Scheffel school

The Viktor von Scheffel School has 14 primary school classes and approx. 25 children per class with a mix of different ethnic backgrounds. There is a primary school support class for preparation in the first class. In the iREAD project currently 25 children from grade 2 and 18 children from the 4th grade are taking part. They are each supported by a class teacher. The school does not have WiFi and has bought the Internet connection with a router over a monthly rate . In the iREAD tablets can therefore not be used simultaneously in several rooms . The tablets are kept with the Director of the school . The school does not have internal IT support.

### Weinbrennerschule

The Weinbrennerschule is recognized as a MINT school. It is an all-day school with two classrooms per year from 1-4$^{th}$ grade with approx. 25 children per class and a proportion of children with different ethnic backgrounds. In the iREAD project there are currently 18 children from the 4th grade taking part in the project. The school is equipped with WiFi . The tablets are kept by the principal , who is also the teacher of the class . The school does not have internal IT support.

### Grundschule am Wasserturm

The Grundschule am Wasserturm is a very young school in a newly development area of the city. It is an all-day school with 2 to 3 classrooms for grades 1-4 and approx. 25 children per class with a mix of different ethnic backgrounds. In the iREAD project children are currently participating in the 1st, 2nd, and 3rd grades. The school is equipped with WiFi. The tablets are kept in a storage room with other technical items. There is a technical contact person but no official internal IT support.

### Leopold School

The Leopold School is a research school that integrates first-class research projects into science teaching. The school is also recognized as a MINT (Math and Technology) school. It is an all-day school. The school classes also include inclusion children and a significant proportion of children from a wide variety of ethnic backgrounds. The school is located in the center of the city and has existed since 1887. More than 100 children from the 1-4. Grades are participating in iRead. The school will be equipped with WiFi from January 2020 . The tablets are kept in the Director’s room. There is no internal IT support.

### 5.3.5 Novice Readers and EFL – Spain (UB)

**Escola Bernaldí Tolrà**

Escola Bernaldí Tolrà is a public school located in Vila-rodona, a village found in a rural area which has 1.255 inhabitants in the area of Tarragona. It is the smallest school in our contet, it only has one line per year and class sizes range from 15 to 23 students. The school building was demolished in 2008 and the students have been placed in five small prefabricated buildings since then. The school encompasses both Kindergarten (ages 3 to 6) and Primary Education (ages 6 to 12). There are several more recently arrived immigrant families in the school, although most children were born in the area. Because of seasonal needs their agricultural environment, migrant children may show up at different points over the academic course and the school is used to accommodating them and helping them integrate in their general course. Children with special needs are integrated in regular classes. English is taught as a foreign language since the first year of Kindergarten.

The class in 2nd grade and the class in 6th grade are participating in iRead. Each class has 18 students and we provided them with 20 tablets. After some adjustments, Wifi started working fine in some parts of the school, although some of their infrastructures are heavily affected by the provisional state of their current buildings. There are two teachers carrying out the project for English (a main teacher and a support teacher) and two teachers for Spanish.

**Col·legi Bon Salvador**

Col·legi Bon Salvador is a semi-private school located in Sant Feliu de Llobregat, which is a city with 45.000 inhabitants and located near Barcelona. The school was founded in 1907 and it is a Catholic religious school. The school is composed of several large buildings and although they are quite old the facilities are up-to-date and Wifi works properly. There is an IT department led by one of the teachers which takes care of any possible issues regarding technology. As for Primary Education, there is one building for 1st and 2nd grade and another building for 3rd to 6th grade students.

There are three lines per year and classes range from 23 to 27 students. It is the largest school we are working with. There are some migrant students, although they are a small minority. There are SEN students in every class. All three 2nd grade classes and all three 6th grade classes participate in iRead. There is one Spanish teacher in charge of the three 2nd grade classes and one English teacher in charge of the three 6th grade classes. Because the students in the six participating groups are in separate buildings, the school was provided with 58 tablets.

**Col·legi Lestonnac**

Col·legi Lestonnac is a semi-private school located in Mollet del Vallès, a city of more than 50.000 inhabitants in the surroundings of Barcelona. The school was founded in 1917 and it is a Catholic religious school, although nowadays not all the students come from catholic families. The school is located a big building in the centre of the city. The educational offer of the school ranges from Kindergarten to High School and has over 700 students. Technological infrastructures are quite good and they have a stable Wifi signal.

There are two classes per year group, and 2nd grade and 6th grade participate in the study. There are 22 to 26 children per class. There is a small proportion of immigrant students coming from different language backgrounds and there are SEN students in all classes. There

is one Spanish teacher and two English teachers that are involved in the iRead project. The school was provided with 30 tablets.

**Escola Lola Anglada**

Escola Lola Anglada is a public school located in Tiana, a village of around 8.700 inhabitants in the outskirts of Barcelona. The school has two lines per year group and offers both Kindergarten and Primary Education. There are only a few migrant families at the school. Most of the classes has at least a SEN student. There are 18 to 24 students per class. In total, there are around 420 students. The school building is rather new, and so are its technological infrastructures. Most of the classes have a digital whiteboard, for instance. They installed a Wifi repeater in the area with the weakest signal for the iRead project and bought a storage box for the tablets of the project.

The two 2nd grade classes and the two 6th grade classes participate in the iRead project. There is a Spanish teacher and an English teacher responsible for it. They have been provided with 23 tablets, since they decided to have a limited commitment to the project. Therefore, they are using iRead less time than the other schools. Specifically one hour every two weeks instead of one hour every week.

**Col·legi Cor de Maria**

Col·legi Cor de Maria is a semi-private school located in Valls, a city of around 25.000 inhabitants in the Tarragona area. The school was founded in the 19th century and it is a Catholic school. The school consists is located in a big building in the centre of the city and has some migrant students, as well as SEN students in almost all classes. They have two classes per year group.The school has been recently involved in very innovative pedagogies, and technology is an important part of the learning objectives of the school students. Therefore, the school has a good Wifi connection and good IT resources in general. The two 2nd grade classes and the two 6th grade classes are involved in the iRead project. There are two Spanish teachers and one English teacher responsible for the project in the school. They were provided with 30 tablets.

**Franciscanes Poblenou**

Franciscanes Poblenou is a semi-private religious schools in the Poblenou district in Barcelona. The school has served the area for decades and has become a reference in the neighbourhood. While still the majority of students come from local families, and increasing number of migrant families send their children to this school, hence reflecting the diversity of the neighbourhood. Following integration practices in the educational environment, SEN students are present in all course. Class sizes range from 22 to 28 students. Their level of technology is quite advanced, and so integrating iRead was relatively easy for them and they were rather welcoming. Teachers needed minimal training before they became independent users. Three teachers are involved in iRead, one EFL teachers in charge of two groups and two Spanish teachers responsible for one group each. They received 30 tablets.

**Escola Sant Nicolau**

Escola Sant Nicolau is a semi-private school located in Sabadell, a city of more than 210.000 inhabitants in the surroundings of Barcelona. The school was founded more than 60 years ago by an important pedagogue as a Catalan non-religious school owned by the school parents. The school consists of a big building in the centre of the city and has around 800 students. There are two classes per year group from Kindergarten to High School. There are 23 to 28

students per class. There are almdost no immigrant students, nor children supported by the government. There are SEN students in every class. English is taught from the beginning of Kindergarten.

Technology is one of the main school interests, and they have invested a lot of resources in this area. They own 30 android tablets, among other important technological resources such as iPads, robots and 3D printers. The two 2nd grade classes and the two 6th grade classes are participating in the project. Four teachers are involved, the two class teachers that teach Spanish in 2nd grade and the two English teachers in 6th grade.

### 5.3.6 EFL – Greece (BC)

**British Council in Greece**
British Council Greece is is the UK's international organisation for cultural relations and educational opportunities, established in Greece in 1939. It is located in the city centre of Athens. As of September 2019, there are approximately 800 students on roll. It is registered in Greece as an English as a Foreign Language school. There are 13 classes within the British Council Greece; 6 classes of A2.2 level, 3 classes of B1.1 level, and 4 classes of B1.2.

Currently, there are 150 pupils of 12 and 13 years old involved in the iRead study, together with the students of IMP Panagiotopoulos. These pupils are supported by eight teaching staff along with the support of IMP Panagiotopoulos. Many young pupils who join the school can speak English as a native language. There are no reports of pupils of the British Council with special educational needs and/or disabilities. (some statistics of the background and educational profile of students could be a good addition) The iRead tablets that will be utilised, will be stored in a secure cupboard under lock with ten recharge points available during office hours. There are 9 dedicated classrooms with wifi network across two teaching floors. There are no reported issues with the internet connectivity and the iRead team have ensured IT support with 2 assistants for the British Council Office.

**IM Panagiotopoulos**
IM Panagiotopoulos is a private school located in the outskirts of Attica, in the city of Pallini. It is an English as an Additional Language school. They collaborate with the British Council and offer additional English-speaking programmes for their students that start at nursery and continue all the way through junior and senior high school. The number of students enrolled in the school is 1,100 students. There are 4 classes of A2+ level, 1 class of A2- level, 3 classes of B1+ level, 1 class of B1- level. Each class consists of 18 students.

Together with the students of British Council Greece, 150 students and eight teachers will participate in the iRead Project. They are at the age of 12 and 13. As far as the students of IMP Panagiotopoulos are concerned, the students are primarily Greek native speakers. There could be some children with dyslexia and dysorthography but nothing that heavily hinders the process. For the purposes of the Project, a wifi connection will be set up for every classroom that will be used, and IT assistant is available on the premises upon request. The tablets are stored within a lockable room overnight with access to charging points. They are stored in tablet baskets that have been sourced through the school.

### 5.3.7 EFL – Sweden (UGOT)

There is no ranking available for Swedish schools of this age group. Similarly, no SES data is available for students of specific schools.

**Kronan**

Kronan is a K-9 comprehensive school located in the suburb of a small town in western Sweden. The school focusses on multilingual learning. Approximately 500 students attend the school. There are on average 2 classes in each year and the classes range from 20-25 students. 40 students and 4 teachers will participate in the project. The students are in year 5, which means they are 11 years old. All participating students have another first language than Swedish and there are about 4 students who have special education needs in these classes. The school has wifi. One of the participating teachers is the school's IT pedagogue, which means there will be nearby support at all times. The teacher will be responsible for charging the tablets they will be stored in a classroom that is locked when the teachers are not there.

**Lextorpsskolan**

Lextorpsskolan is a K-6 comprehensive school located in the suburb of a small town in western Sweden. Approximately 300 students attend the school. There are 2-3 classes in each year and the classes range from 15-23 students. 140 students and 3 teachers will participate in the project. The students are in year 4-6, which means they are 10-12 years old. About 90% of the students have another first language than Swedish and there are about 10 students who have special education needs in these classes. The school has wifi. There is IT support available for the town as a whole, but locally they rely on 'super users', teachers who are especially confident in IT matters. The tablets will be charged and stored overnight on trolleys in a locked room.

**Onsala Montessoriskola**

Onsala Montessori school is a K-9 independent school managed by parents and staff in a cooperative. It is located in the countryside near the coast in western Sweden. Approximately 220 students attend the school. There is one class in each year. The classes range from 18-26 students. 2 classes and 2 teachers will participate in the project. The students are in year 4-5, which means they are 10-11 years old. Very few of the students have another first language than Swedish, about 4-5 in the school as a whole. 4-5 students who have special education needs will participate in the project. The school has wifi and there is IT support available in the mornings. The tablets will be stored overnight in a locked classroom and will be charged continuously throughout the day.

**Västergårdsskolan**

Västergårdsskolan is a K-6 comprehensive school located on a small island in the Gothenburg archipelago, western Sweden. Approximately 140 students attend the school. There is one class in each year and the classes range from 14-25 students. 67 students and 5 teachers will participate in the project. The students are in year 3, 5 and 6, which means they are 9-12 years old. 5 students have another first language than Swedish and there are 3 students in year 3, 2 in year 5 and 3 in year 6 who have special education needs. The school has wifi (fiber). There is central IT support available, and locally there is a teacher responsible for IT matters. The tablets will be charged and stored overnight in the teachers' office.

### Kullaviksskolan

Kullaviksskolan is a K-9 comprehensive school located in a village close to the sea in western Sweden. Approximately 760 students attend the school. There are three classes in each year and the classes range from 24-28 students. 81 students and 2 teachers will participate in the project. The students are in year 5, which means they are 11 years old. 1 student have another first language than Swedish and there are 3 students who have special education needs. The school has wifi. There is IT support available a few days a week. The tablets will be charged and stored overnight in a computer cabinet.

### Kannebäcksskolan

Kannebäcksskolan is comprehensive K-9 school located the city of Gothenburg in western Sweden. The school has two tracks, one for deaf and hearing impaired children, and one for children with speech and language disorders. In total 80 students attend the school. There is one class in each year and there are 6-8 students per class. 16 students and 2 teachers from the speech and language track will participate in the project. The students participating will be 12 and 14 years old. The students at this school have the same curriculum and syllabus as other comprehensive schools, but as they have a language disorder they all have various needs of special needs education. About one third of the students have another first language than Swedish. The school has wifi. There is IT support available via the intraservice for all schools in Gothenburg . The tablets will be stored in locked cabinets and they will be charged in the classroom.

#### Oscar Fredriksskolan

Oscar Fredriksskolan is a K-6 comprehensive school located in the city centre of Gothenburg in western Sweden. Approximately 550 students attend the school. There are three classes in each year and there are about 25 students in each class. 66 students and 2 teachers will participate in the project. The students are in year 5, which means they are 11 years old. 2 students have another first language than Swedish and there are 7-10 students who have special education needs. The school has well-functioning wifi. The students can both log in with their own accounts and on a guest network. There is IT support available a few days a week. The tablets will be stored in a computer cabinet and charged in the classroom.

### 5.3.8 EFL – Romania (ULBS)

#### National College „Samuel von Brukenthal” Sibiu

"Samuel von Brukenthal" National College it is one of the best city public school from Sibiu. It is a state German school in Romania, which was first officially attested in 1380. It is one of the best high schools in Romania, which carries on the German tradition in Transylvanian schools. It offers high quality education to all the secondary and high school pupils and its aim is to promote the cultural values and the necessary knowledge according to the syllabus, thus contributing to the development of the pupils’ personality. The educational offer contains not only the regular courses, but also a wide variety of complementary educational projects, which involve the extra efforts of the teachers who encourage the pupils' team spirit and assuming responsibilities.

The school has two Informatics laboratories which includes around 60 computers. The school support WiFi and also cabled networks. The existing internet bandwidth is sufficient for supporting the daily school needs, as well as the additional internet requirements posed by the iRead technologies. The tablets are stored in cabinets that are locked by the teachers

responsible for the project and exists sufficient charging stations, the recharging of tablets batteries being accomplished just by teachers not by students.

In National College „Samuel von Brukenthal" each year there are around 860 pupils distributed in 30 classes on 8 levels (from 5th class until 12th class). The average class size in the school is 29 pupils. Students come from all ethnic backgrounds in Sibiu (Romanian, Hungarian, German, Roma), existing even children from Germany, Austria, whose parents work at multinational companies in Sibiu. In almost all disciplines the language of instruction in the school is German and almost half of pupils speak English as an additional language. There are no SEN (special education needs) pupils in this school.

Currently, there are 57 pupils involved in the iRead study, readers from years 4 and 5 (born in 2007 and 2008). These pupils are supported by three teaching staff. One of the teaching staff ensures also the IT support within the school, working with iRead researchers to address internet connectivity and storage solutions. Researchers and school staff began working together from March 2019. In these early stages of setting up the technologies, it was identified the school existing internet bandwidth and the additional internet requirements posed by the iRead technologies, WiFi connectivity, etc.

**"IOAN SLAVICI" School, Sibiu, Romania**

„Ioan Slavici" School is a city public school in Sibiu which was founded in 1965. It provides educational services for preschool, primary and secondary pupils. The logo of the school is „Together for the 21st century" and we focus on democratic values and principles, on the involvement of the local community into the school activities and the expansion of the school services regarding our community. We aim to create an educational climate based on achievement, competition and cooperation and to support the development and chance equality of each pupil.

The school has two ITC laboratories equipped with 40 computers. The school supports WiFi networks. The existing internet bandwidth is sufficient for supporting the daily school needs, as well as the additional internet requirements posed by the iRead technologies. The tablets are stored in an office that is locked by the teachers responsible for the project. The English teacher is charged with the use of the tablets during the English classes. The students involved in the project have been instructed on the usage of the tablets during classes.

In „Ioan Slavici" School there are around 600 students each year, distributed in 28 classes on 10 levels (from kindergarten to 8th grade). The average class size in the school is 25. Students come from the area surrounding the school premises. The language of instruction in the school is Romanian and students start studying English as a foreign language in the preparatory grade. There are 19 SEN (special education needs) students in this school.

Currently, there are 20 pupils involved in the iRead study, readers in the 8th grade. These pupils are supported by two members of the teaching staff, the school principal and an English teacher. The first activities in the current project began in March 2019. In these early stages of setting up the technologies, there were several meetings of the team members meant to identify the school technical equipment, the additional requirements posed by the iRead technologies, administrative issues, the instruction of the teachers involved, the target group of students involved and the planning of the further activities.

**No. 13 Secondary School, Sibiu, Romania**

No. 13 Secondary School is situated in Sibiu, a city in Transylvania, central Romania. It opened its doors to children in 1937 and after 79 years, a new building was built next to the old one so that all the students can start classes in the morning.

No. 13 Secondary School is trying to support its students, helping them to develop their skills and reach their goals. The instructive-educational process offered by our school is of high quality, being mirrored in the results achieved by students in competitions and exams.

The school has one Informatics laboratory which includes around 30 computers. The school supports WiFi and also cabled networks. Almost all classrooms are equipped with whiteboards and video projectors. The iRead tablets are stored in a cabinet that is locked by the teacher responsible for the project. There are sufficient charging stations, the recharging of tablets batteries being accomplished just by the teacher.

In No. 13 Secondary School each year there are around 635 pupils aged between 6 and 14 years old, divided in two cycles, primary and secondary and distributed in 26 classes on 9 levels (from preparatory class until 8th class). The average class size in the school is 25 pupils. Almost half of pupils speak English as an additional language. There are 15 SEN (special education needs) pupils in this school.

Currently, there are 19 pupils involved in the iRead study, readers from years 4 and 5 (born in 2007 and 2008). These pupils are supported by three teaching staff. Researchers and school staff began working together from March 2019.

**The "Ferdinand King" Gymnasium School, Sibiu, Romania**

“King Ferdinand School” is a non-fee paying urban secondary school with a national-based developed curriculum. The school was opened in 1989, the year of great social problems in Romanian. It is situated in an area where most parents belong to the working class. The school has 450 students aged between 6 and 14. Primary school students and a part of secondary school students learn in the morning, the others in the afternoon as we don’t have enough available classrooms. The average class size is 25 students. Currently 12 students are involved in the iRead study aged 13-14. There are no SEN (special education needs) students involved in the project. The school is trying to support its students, helping them to develop their skills and reach their goals.

**Technological High School "Ioan Lupaș" Sălişte, Sibiu county, Romania**

The EFL study was done on Gymnasium school which is enclosed in Technological High School "Ioan Lupaș" Sălişte. It is non-fee paying rural secondary school with a national-based developed curriculum. The school is located in a rural area of Sibiu County. The town even it is small gave birth to 11 academicians during the last 150 years. Teachers utilise guided reading aligned with the curriculum learning objectives. "Ioan Lupaș" High School from Săliște is one of the oldest Romanian Schools from Transylvania. The school is situated in the centre of the town Săliște, at about 25 km from Sibiu. It dates from 1616 and the name of the school comes from the academician Ioan Lupaș, who was also a teacher, a politician and a priest. The school has: a kindergarten, a primary school, a secondary school, a high school and a

professional one. The school has one informatics laboratory which includes around 20 computers. The school support WIFI and also cabled networks. The existing Internet is sufficient for daily school needs, as well as the additional Internet requirements posed by IRead technologies. The tablets are stored in the Language laboratory and are used under the teachers' surveillance. In "Ioan Lupas" High School from Sălișteare there are about 700 students distributed in 25 classes on 13 levels (from 0 class until 12 class). The students learn English and French as foreign languages. In this school the teachers do their best to help their students develop their language and communications skills using all kinds of modern and interesting teaching methods and materials. There are 26 participants in EFL study.

**The Tilişca Secondary School, County of Sibiu, Romania**

It is non-fee paying rural secondary school with a national-based developed curriculum. It was founded in 1651. The school is located in a rural area, at about 27 km far away from city of Sibiu. Tilișca village is placed in the area named "Mărginimea Sibiului", a well-known area for its landscapes and for the people's occupation, they are sheep breeders.

168 pupils are learning this year in our school. They are distributed on 10 levels (from kindergarten to 8th grade). The average class size in the school is 15. The language of instruction in the school is Romanian and students start studying English as a foreign language in the preparatory grade. There are 6 SEN (special education needs) students in this school. The school has one ITC laboratory equipped with 20 computers. The school supports the WI-FI network.

The iRead tablets are stored in an office that is locked by the teacher responsible for the project. The English teacher is charged with the use of the tablets during the English classes. The students involved in the project have been instructed on the usage of the tablets during classes.

There are 15 pupils involved in the iRead study, readers in the 6th grade. These pupils are supported by the English teacher. The first activities in the current project began in March 2019. In these early stages of setting up the technologies, there were several meetings of the team members meant to identify the school technical equipment, the additional requirements posed by the iRead technologies, administrative issues, the instruction of the teacher involved, the target group of students involved and the planning of the further activities.

# 6 Unsupervised use of Navigo 'Online Pilot'

The "on-line" pilot is one of iRead's evaluation pilot studies. It focuses on the English and Greek domain models. In the on-line pilot, users register themselves (with parental supervision) and play freely, while the iRead system guides them through.

In order to achieve that, a web-site needs to be developed and hosted, so a new user can register herself, activate her account and supply her with tools to manage, overview or delete her account. The existence of this site is necessary since, on-line users do not have any direct communication with iRead administrators. They interact with iRead either from the NAVIGO application or directly from the on-line pilot web-site.

The site of the on-line pilot allows to users to register themselves and manage their accounts or even request to delete their accounts. Users can land to this site either directly or they can be redirected from the NAVIGO application (since the existence of an account is necessary to proceed). The URL of the site is: https://www.iread-services.eu/onlinePilot. From there, they can guide themselves through and create/ manage their accounts. All pages of the web site are available both in English and Greek.

In this section, we describe the operation of the developed web-site for the on-line pilot.

## 6.1 Web page

The landing page has been designed to provide all the available information regarding iRead and the NAVIGO application, alongside with the necessary tools (login, register, etc.).

### 6.1.1 Top

At the top part of the landing page the user can see under the logo of the NAVIGO, a short description of the application. At the background several images from the game are being displayed to give a glimpse of the gameplay. Right after the description there are three buttons. The first, the google play button, redirect user to the Google Play site to download the game at the user's device. The second and the third, the "Login/Register" and the "About the Game" buttons, move the user to the corresponding part of the landing page to either login to her account or register to create a new account or to learn more information regarding to the NAVIGO application.


**Figure 6-1: Landing page - Top part**

At the top left of the landing page is available the "Language" button, which allow to the user to change the display language. The available choices are "English" and "Greek" ("ΕΛΛΗΝΙΚΑ"), as is shown in Figure 6-2.

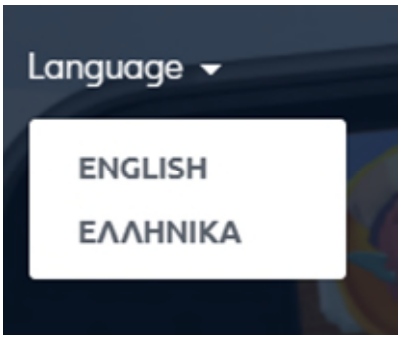



**Figure 6-2: Language selection**

At the top right of the landing page is available the *menu* button. As is shown in Figure 6-3 a bar appears above the top part with six buttons. The buttons “home”, “login/register”, “about the game”, “watch trailer” move the user to the corresponding part of the landing page. The “download” button redirects users to the Google Play to download the game. Lastly the “activate account” button redirect users to the page from which they can activate an existing account, which registration has not been completed (see paragraph 6.1.6 for more details)

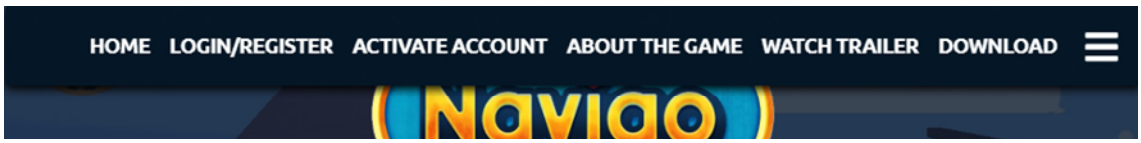



**Figure 6-3: Landing page - menu bar**

### 6.1.2 “Login/Register”

The “Login/Register” part consists of two parts. The Login part has a button which allow users to provide their credentials and login to their accounts. Above the button, the user can read details regarding to the supported tools, which she can access with her account. To login, users should have the username of the account and its password.

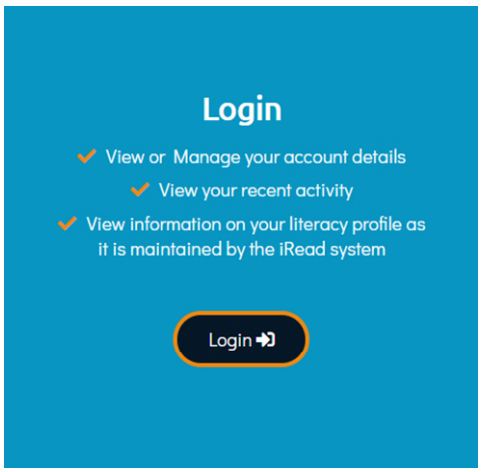



**Figure 6-4: Landing page - Login part**

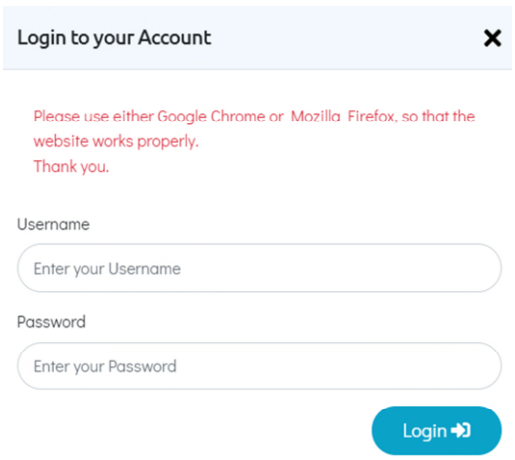



**Figure 6-5: Landing page - Login form**

At the login page, the user is informed to use the site from either the Google Chrome or the Mozilla Firefox browsers since the site is tested to function properly with these two browsers. If user don’t give valid credentials on her attempt to login, the site is loaded again and a corresponding message is displayed.


**Figure 6-6: Landing page – Message**

In case that any other internal issue is raised, the user sees a similar panel with a corresponding message which inform her for the error.

The Registration part has a button which allows users to access the registration form. A user, in order to register herself, should provide all the requested information to initialize her account. The provided information is used, mainly, for statistical purposes/analysis and is available to the iRead system for as long the user maintains her account or, with her consent, after anonymization.

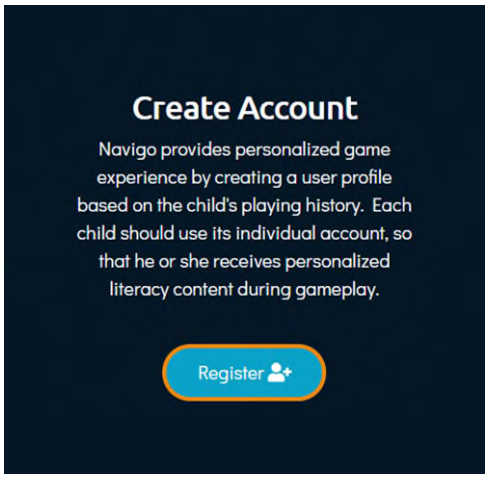



**Figure 6-7: Landing page - Register part**

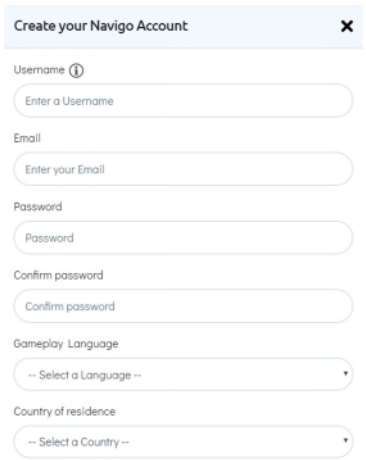



**Figure 6-8: Landing page - Register form - 1**

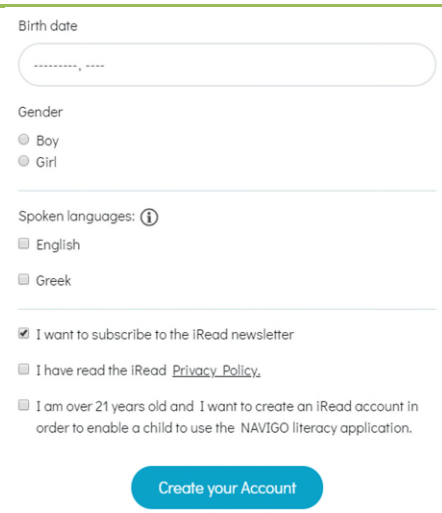



**Figure 6-9: Landing page - Register form - 2**

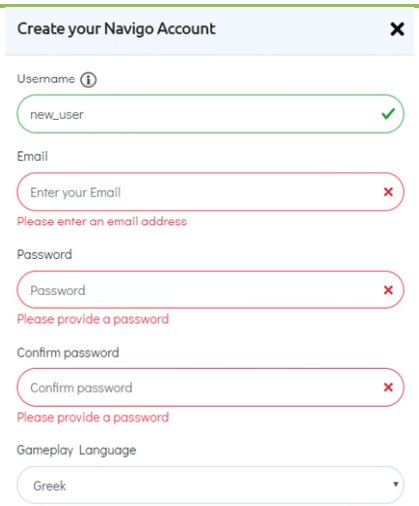



**Figure 6-10: Landing page - Registration form - error example**

Above the register button appears a short text, which explain the reason of the existence of the account on the iRead system. At the registration form the parent/guardian of the user should provide the requested information which is: username, email, password, gameplay language, country of residence, birth date (year and month), gender, spoken languages, if they want to subscribe to the iRead newsletter, confirmation to the facts that they have read the Privacy Policy (which is provided with a link to read it on a pdf file) and that the

*parent*/guardian who registers the user is over 21 and she wants to create the account with iRead. For each field there are some rules that the user must respect. In case that the value of a field violates a rule, the corresponding field is colored red and below a message is being displayed to inform user about the error and guide him to correct it. When the user provides a valid (based on the rules) value the corresponding field is colored green to inform her about the correctness of the value. When the user fills all the fields correctly, she can press the "Create your Account" button and proceed with her registration (see paragraph 6.1.6 for more details).

### 6.1.3 "About NAVIGO"

The "About NAVIGO" part provides an easy and user-friendly way to present the key points and the advantages of the iRead system and the NAVIGO application. In a carousel format, currently seven, detailed tabs allow users to be informed about iRead and NAVIGO. Besides that, at the bottom there is a button which redirect the user to the iRead official site.

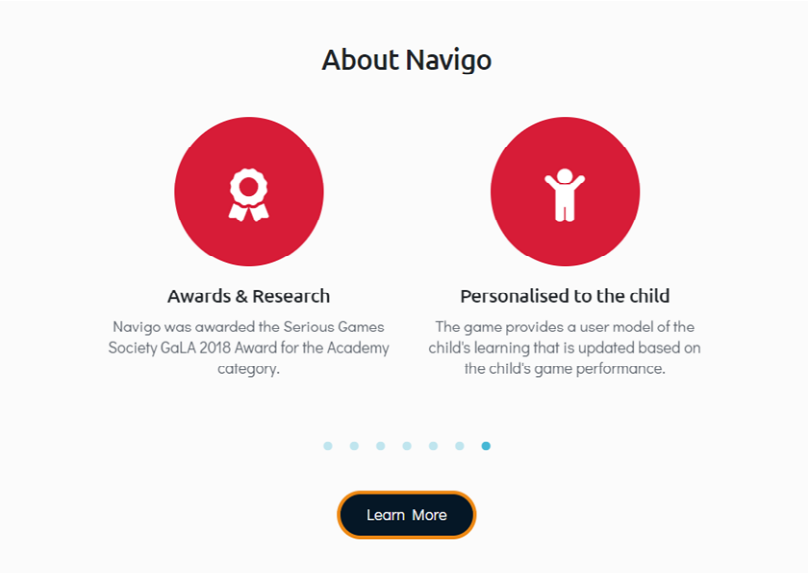



**Figure 6-11: Landing page - About NAVIGO**

### 6.1.4 "Trailer"

At the trailer part the user can watch the NAVIGO's trailer from YouTube to take a glimpse of the application gameplay.

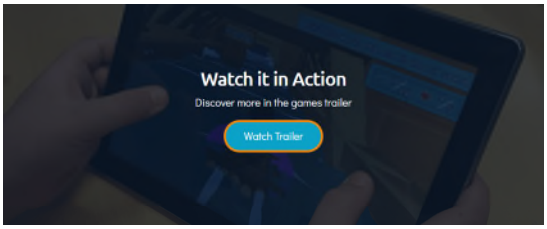



**Figure 6-12: Landing page - Trailer**

**Figure 6-13: Landing page - Trailer - YouTube**

### 6.1.5 Bottom of Landing Page

At the bottom of the landing page there are the logos of the NAVIGO application, of the iRead and of the FishInaBottle company, which has developed the game. Also, the user can find the

pages of iRead in Facebook and in Tweeter as well as the pages of NAVIGO in YouTube and Google Play. Below that, the user can find the email to conduct the administrator of the on-line pilot. Next to the email there are links to iRead's Privacy and to the official site of the iRead project. Lastly, there is a row which indicates that the iRead project is a 4-year European funded project through the Horizon 2020 Innovation Program.

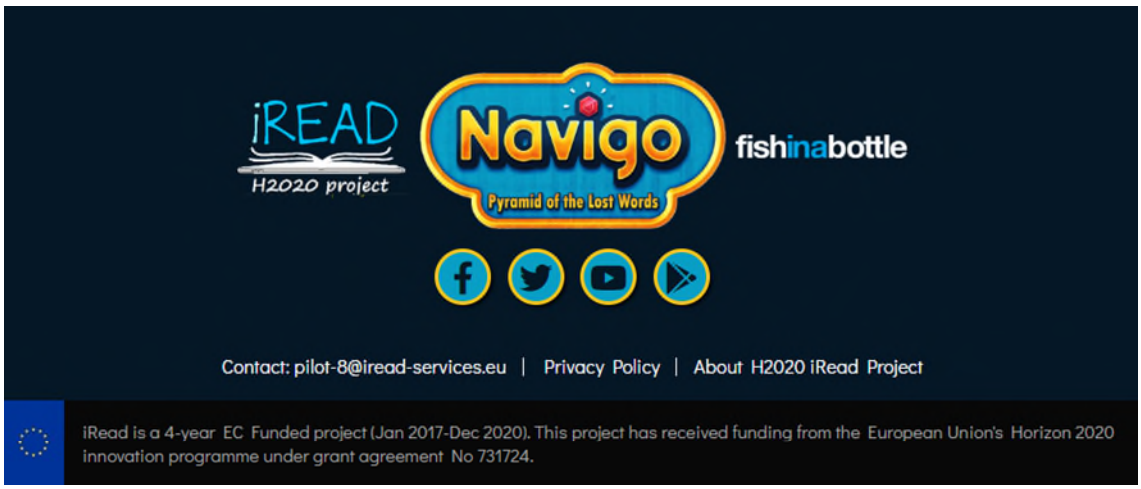



**Figure 6-14: Landing page- Bottom**

### 6.1.6 Registration

The registration process of a user takes place in two steps. In the **first step**, the parent of the new user should fill the registration form (as it is described on paragraph 6.1.2, at the registration part). When the user fills all fields with valid values, she can proceed with her registration. When the user presses the "Create your Account" button, the iRead system gets a request with the data from the registration form and creates a new account with the given information. The new account is disabled, until the user activates it. On the **second step**, the user has to activate the new account. To do so, she is redirect to the "Activate account" page. In the meanwhile, the system sends her an email (to the declared email address) that contains a link she has to follow in order to activate her account.

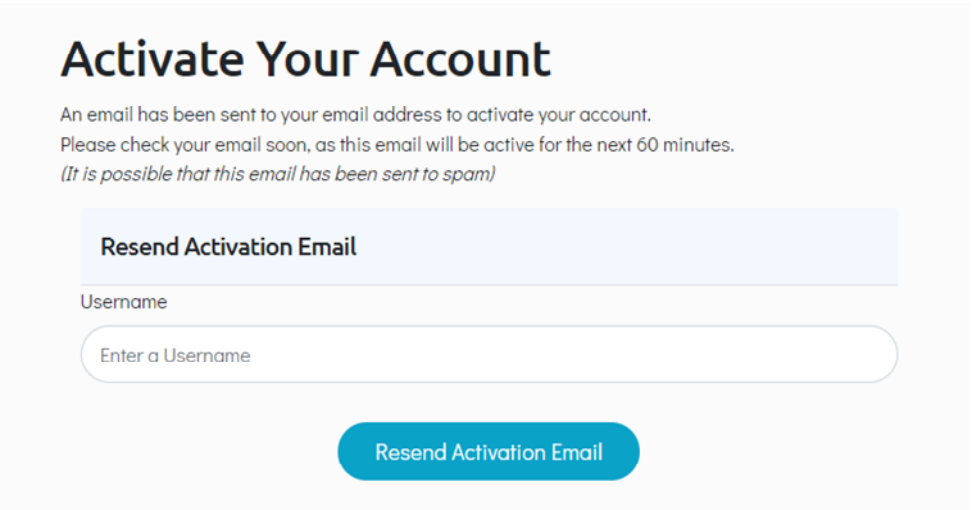



**Figure 6-15: Activate Account Page**

Through this page (which always available through the menu bar at the landing page) the user is notified that an email has been sent. In addition, the page informs her that this email will be active for 60 only minutes. In any case (if the activation email expires or it wasn't delivered)

the user can provide the username of the account and a new activation email will be sent to the declared email address.

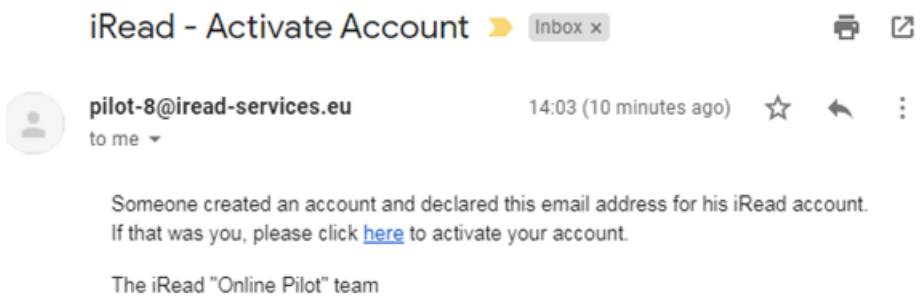



**Figure 6-16: Activation Email**

The user, through her email client, can access the activation email. By clicking the enclosed link (under the word *here*) the account is being activated and the user is redirected to a page which inform her about this. If the user uses an activation email for an already activated account, she is redirected to a page which inform her about this. The account activation through the email can be performed from any device, which means that the user can create the account from her computer/tablet but she can use the activation email from her mobile phone or any other device or browser.

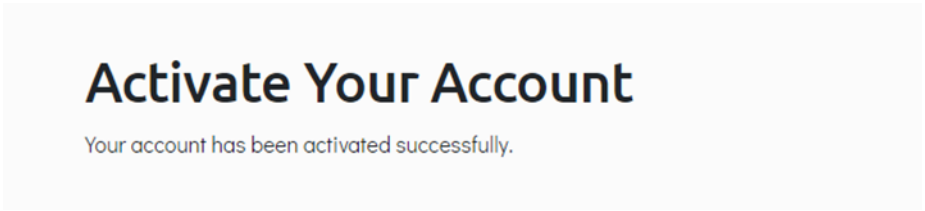



**Figure 6-17: Activation Account - Verification page**

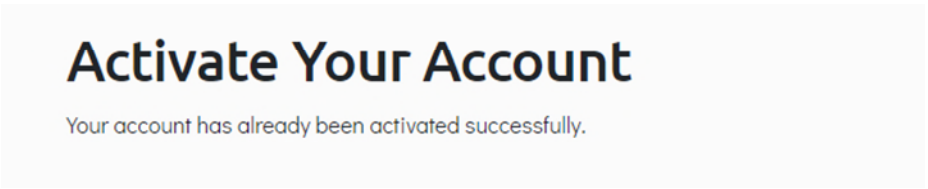



**Figure 6-18: Activation Account - Verification page - Already activated message**

After the account activation, the user is ready to play the NAVIGO application and to manage her account through the on-line pilots web-site.

### 6.1.7 Account management

Users with activated accounts can login at the on-line pilot's site to manage, overview or request deletion of their accounts. As it is described in paragraph 6.1.2 the user can login with her account's credentials, through the login form. After a successful login, the user is redirected to the account management page, which retrieves the account's details from the iRead system. The displaying language of this page is selected based on the account preferences.

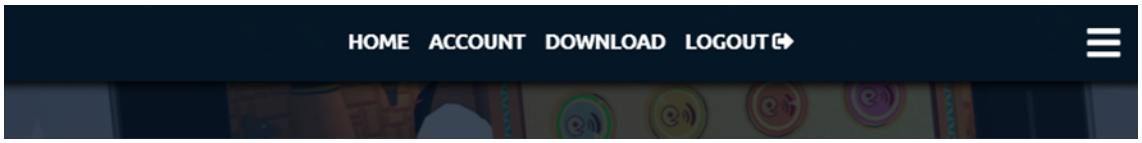



**Figure 6-19: Account Management - menu bar**

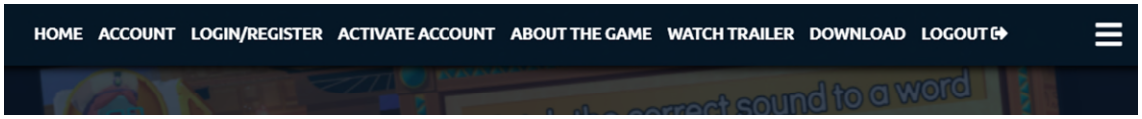



**Figure 6-20: Landing page - menu bar - with logged in account**

When the user has logged in, the menu bar provides four buttons. The first “Home” redirects the user to the landing page (which now has two more buttons the “Account”, which leads back to the account management page, and the “Logout” button to logout from the account). The “Account” button loads the account management page. The “Download” redirects user to the Google Play page to download the NAVIGO application. The last button “Logout” logout the user from the account and redirects her back to the landing page. At the “main part” of the account management pages there are a few tabs.

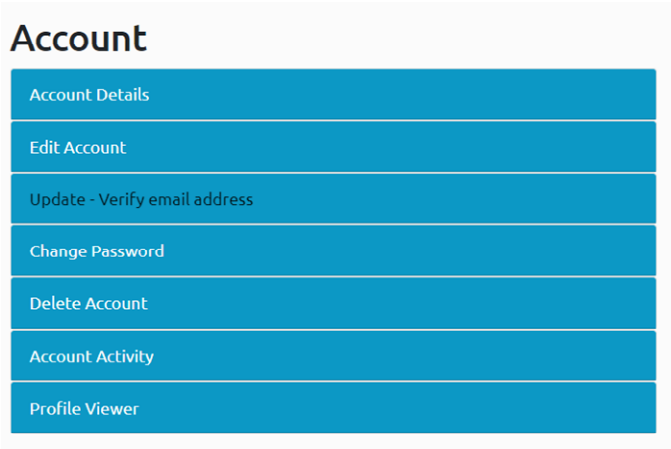



**Figure 6-21: Account management - All tabs**

### 6.1.8 Account Details

The first one is the “Account Details” tab, where she can overview the details of her account (see Figure 6-22). The following information is displayed: username, email, if the email address is verified, the country of residence, the gender, the birth date, the list of the spoken languages, the gameplay language and whether the user wants to receive the iRead newsletter. Every time the account management page is loaded, these fields are updated with the current values as they are stored in the iRead system.

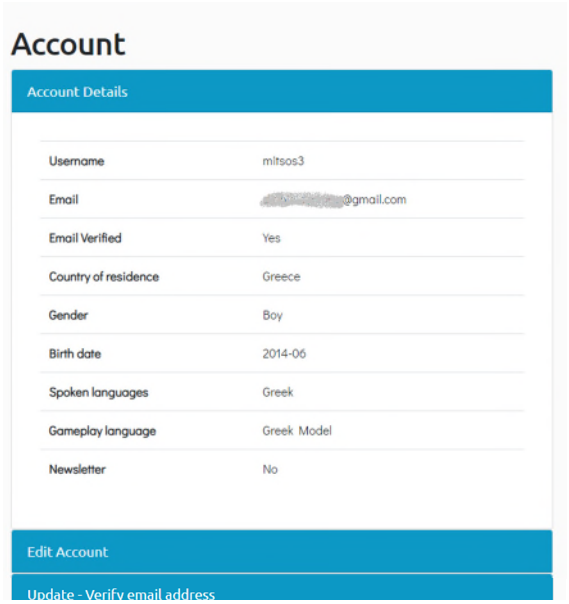



**Figure 6-22: Account management - Account details**

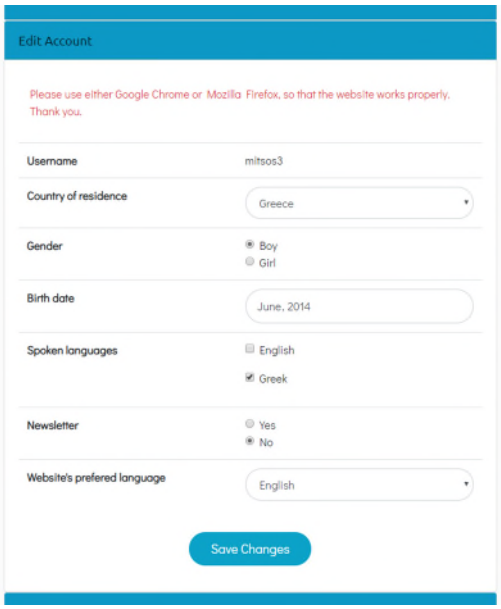



**Figure 6-23: Account management - Edit Account**

### 6.1.9 Edit Account

In case that the user wants to update the details of her account, she can use the "Edit Account" tab (see Figure 6-23). With the assistance of this tab the user can update the following attributes: country of residence, gender, birth date, spoken languages, whether she wants to receive or not the iRead newsletter and the default displaying language of the site (the user can change the displaying language at any time from the language button at the top left of each page, but this change will affect only her current session and it will not be a permanent change).

### 6.1.10 Update Email Address

On a separate tab, the user can update the email address of her account. To do so, she has to provide a new email address and press the "Verify" button (see Figure 6-24). When user presses the button, the email attribute of the account is updated and a verification email is sent to the given email address to verify it. This email expires after 60 minutes. In case that the verification email expired or it wasn't delivered the user can rewrite the email address and request to send a new verification email at the given email address. The user can verify her email from any device (like her mobile phone or from other browser) independently from where she has logged in. If an expired verification email is used, the "wait page" will inform her and a new verification will be sent to the same email address.

The verification email contains a link, which she can use to verify her email (see Figure 6-26). This link contains encrypted information about the account to be updated, the email to be verified and the time the verification email was created. These three values are used by the system to decide whether the verification request it receives is valid or not.

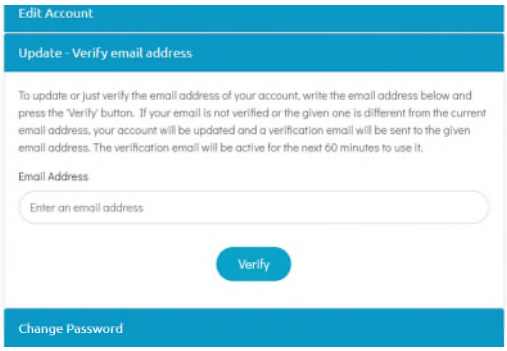



**Figure 6-24: Account management - Update or Verify email address**

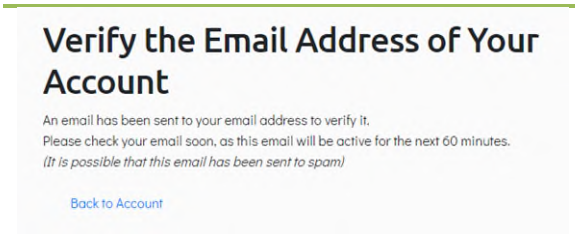



**Figure 6-25: Email verification - wait page**

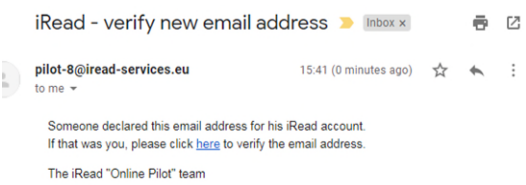



**Figure 6-26: Verification email**

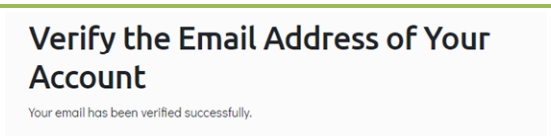



**Figure 6-27: Successful verification**

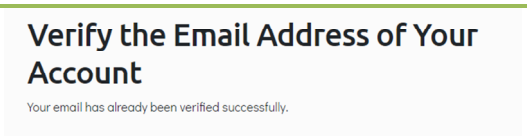



**Figure 6-28: Already verified email - message**

### 6.1.11 "Change Password"

Any user can change the password of her account, by using the "Change Password" tab. First, she has to confirm her credentials, so she has to provide her username and her current password. If the credentials are valid, she is redirected to the change password page (see Figure 6-31). There, she has to provide again the current password and the new one (with confirmation). Then, she presses the "Save" button to store the changes. To return to the on-line pilot site, she can press the "Back to Online Pilot" button at the top left of the page. The change of the password is effective immediately.

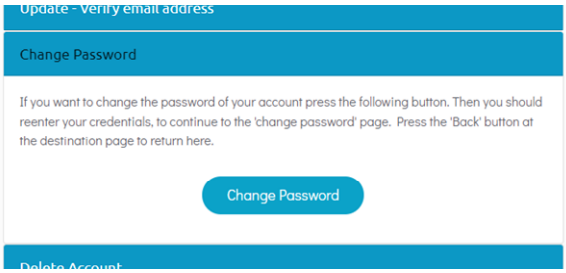



Figure 6-29: Account management - Change password


Figure 6-30: Change password - confirm credentials form

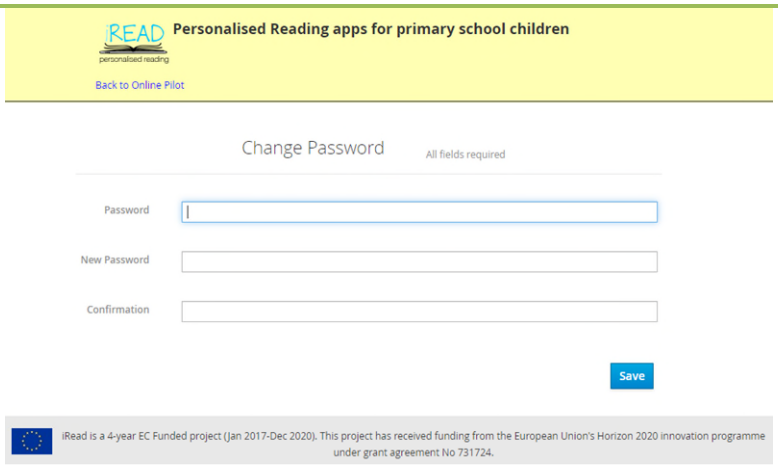



Figure 6-31: Change password form

### 6.1.12 "Delete Account"

Any logged-in user can request the deletion of her account. In order for a user to proceed with her deletion request, she has to have her email address verified since the deletion process also includes an email verification step.

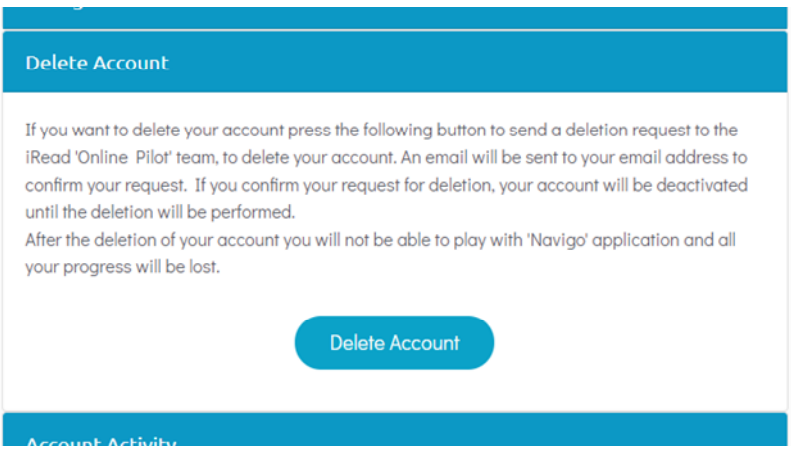



Figure 6-32: Account Management - Delete Account

When user press the "Delete Account" button, an email is sent to the verified email address of the account. This email informs the user that she (or someone) has requested to delete the account. The email asks the user whether she allows iRead to keep the non-personal anonymized data for statistical analysis by the iRead team. The user can select one from the two available links. The first one sends a request for anonymization and the second one sends a request for full deletion to the on-line pilot administrator.

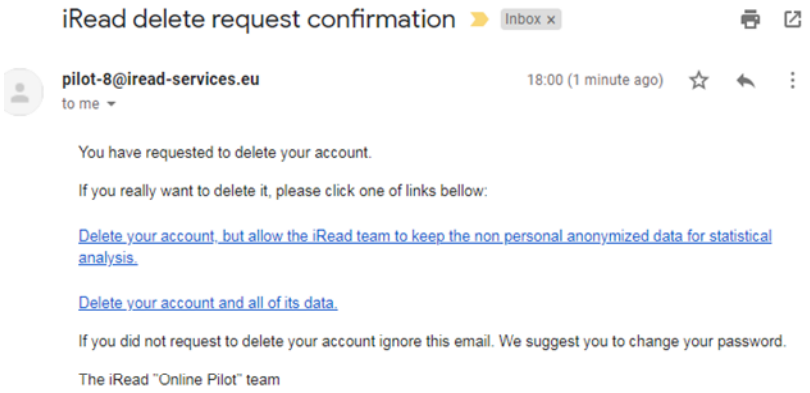



**Figure 6-33: The verification email for the account deletion**

When the user decides which deletion option she prefers and she click on it, the server get a corresponding request. The server sends an email to inform the administrator, who will perform the deletion and it deactivates the account of the user. The user will not be able to login either to NAVIGO or to the on-line pilot site. The user is redirected to the landing page and she is logged out from her account.

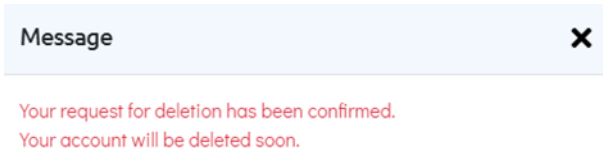



**Figure 6-34: Deletion message**

### 6.1.13 "Account Activity"

The logged in user can overview the activity of her account. Through the "Account Activity" tab she can see when 4 basic events took place. When the current session started, when the previous session started, when she registered and when the last edit of the account did happen. All times are displayed in "London time".

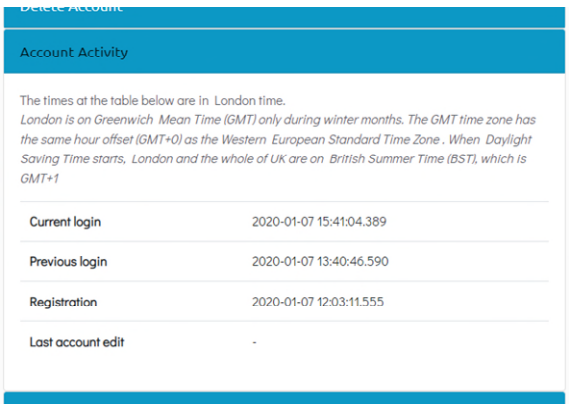



**Figure 6-35: Account Management - Account Activity**

### 6.1.14 "Profile Viewer"

The last tab is the "Profile Viewer". From there, the user can overview her status on the corresponding linguistic model they work with. This tool demonstrates the profile of the user

(which are the linguistic parts that she can study through the game) and the scores of the user on each one (as it is stored at the iRead system).

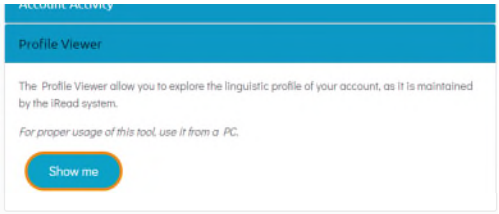



**Figure 6-36: Account Management - Profile Viewer**

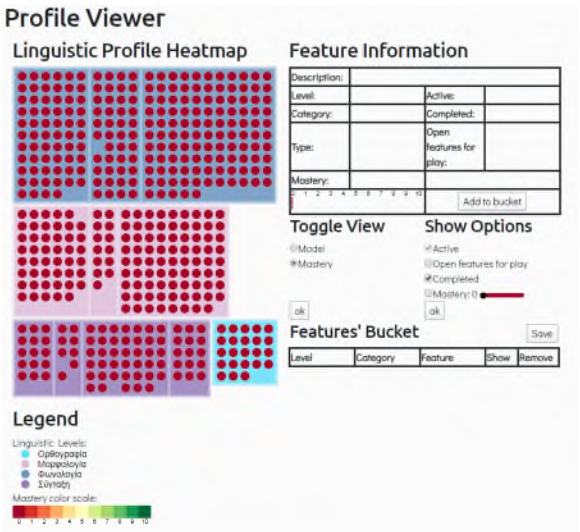



**Figure 6-37: The Profile Viewer Tool**

## 6.1.15 Current usage

In this section, we display some statistics regarding to the current (January 7th 2020) usage of the on-line pilot. The figure below shows a graph with the number of registered users per each month. From the starting month of September, we have 70 registered users. The numbers are expected to increase in the months to follow.

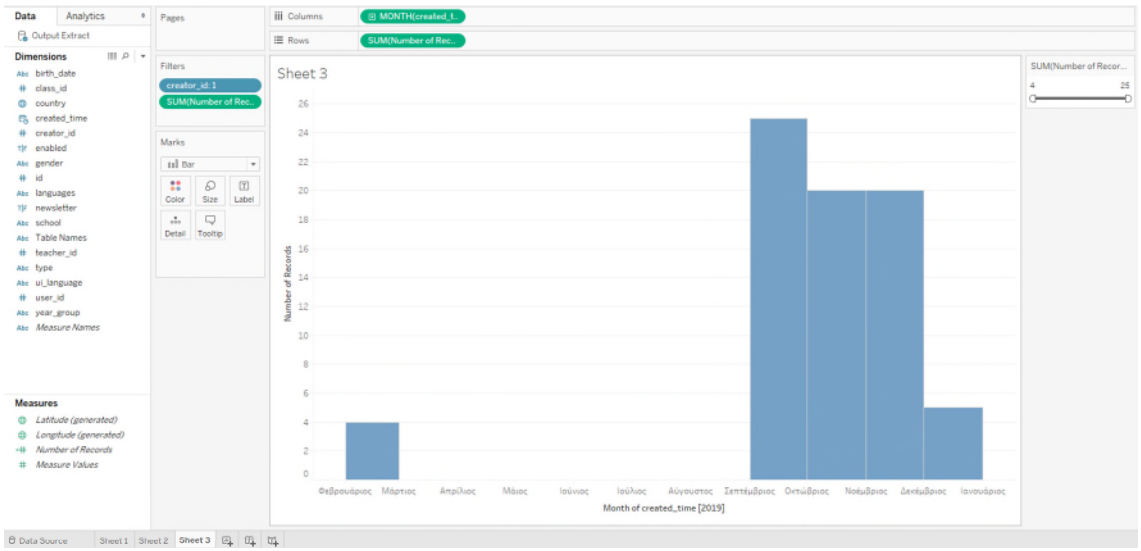



**Figure 6-38: Current usage of the on-line pilot**

# 7 Appendix

## 7.1 EFL study materials

**Appendix A. Target texts with target morphemes highlighted**

**Text 1**

Whether you are travelling to the islands or the mountains of Thailand, you are likely to spend at least one night in its capital city on the way. Bangkok has a population of over 8,000,000. There has been a lot of development in recent years. It is noisy, and there is a lot of pollution, but it is also an exciting city with plenty of things to see and do. Why not make it a longer stay?

Looking for accommodation?
Phra Kanong offers an unusual place to stay, with its fantastic street markets where people from Bangkok eat, work and live. Its location is not as convenient for the main tourist sites, but it has a Skytrain stop, so you can be at the Grand Palace in twenty minutes.

Getting around the city
Movement around the city can be a nightmare. Sure, you can easily take a taxi if you want to spend hours stuck in traffic jams, but there are two much better ways to get around the city. To explore the temples and historical sites, catch an express boat river taxi or a longtail boat along the Chao Phraya river and the canals.

Where to eat
Everywhere! There are street food stands with little plastic seats where you can sit and eat, and they cook the same dish over and over. Head for the excitement of Chinatown – Yaowarat Street – and choose whatever looks most interesting from the many excellent Chinese and Thai restaurants and food stands.

Entertainment
After you have seen the main sites like the Giant Buddha at the temple of Wat Pho and the spectacular Grand Palace and shopped at Chatuchak market, check out the snake farm and watch the live snake show. You can even touch a snake yourself if you want to.

**Text 2**

The attraction of social media is growing. People in their 50s are joining Facebook in increasing numbers. They will soon be the second biggest group on the site, with 3,500.000 people aged 55–64 and 2,900,000 over-65s.

Sheila, aged 59, says, 'I joined to see my grandchildren, as my daughter posts videos and photos of them. It's a much better way of communication than through letters and photos in the post. That's how we did it when I was a child, but I think I'm lucky I get to see so much more of their lives than my grandparents did.'

There has been a movement among young people away from Facebook but they still use their smartphones. Chloe, aged 15, even sleeps with her phone. 'It's my alarm clock so I have to,' she says. 'I look at it before I go to sleep and as soon as I wake up.'

There is much interest in how teenagers have acquired their social media habits, but many may have their parents to thank, as their parents were the early adopters of the smartphone. Peter, 38 and father of two teenagers, reports that he used to be on his phone or laptop all the time. 'I work for the government, and I was always online, and I felt like I was always at work,' he says. 'How could I tell my kids to get off their phones? There would just be an argument.'

Unlike her grandmother, Chloe is spending so much time on her phone at home that she is missing out on entertainment with her friends in real life. Sheila, on the other hand, has made connections with old friends from primary school and secondary education that she has not heard from in forty years. 'We use Facebook to arrange to meet all over the country,' she says. 'It has changed my social life completely.'

**Text 3**

Fairies today are the stuff of excitement. Little magical people with wings, often shining with light. Typically, pretty and female, like Tinkerbell in Peter Pan, they usually use their magic to do small things and are mostly friendly to humans.

We owe many of our modern ideas about fairies to Shakespeare and stories from the 18th and 19th centuries. Although we can see the origins of fairies as far back as the Ancient Greeks, we can see similar creatures in many cultures. The earliest fairy-like creatures can be found in the Greek idea that locations like trees and rivers had spirits called dryads and nymphs. Some people think these creatures were originally the gods of earlier, pagan faiths that worshipped nature. They were replaced by the Greek and Roman gods, and then later by the Christian God, and became smaller, less powerful figures as they lost their attraction.

Discussion suggests the origin of fairies is a memory of real people, not spirits. So, for example, when groups with metal weapons invaded land where people only used stone weapons, some of the people escaped and hid in forests and caves. Further support for this argument is that fairies were thought to be afraid of iron and could not touch it. Because they were outside of society, these people probably stole food and attacked villages. This might explain why fairies were often described as playing tricks on humans for their entertainment.

While most people no longer believe in fairies, only a hundred years ago some people were very willing to think they might exist. In 1917, 16-year-old Elsie Wright took two photos of her cousin, nine-year-old Frances Griffiths, with fairies. Some photography experts thought they were fake, while others were not sure. But Arthur Conan Doyle, who wrote the Sherlock Holmes detective stories, believed they were real. He published the original pictures, in a magazine called The Strand, in 1920 and tried to have them displayed in an exhibition. The girls only admitted the photos were fake years later in 1983, created using pictures of dancers that Elsie copied from an advertisement in a book.

**Text 4**

By 2010, NASA had found 90 per cent of the asteroids near Earth measuring 1 kilometre wide. These 'near-Earth objects', or NEOs, are the size of mountains and include anything within 50,000,000 kilometres of Earth's orbit. In a recent communication, NASA said none of the asteroids are a risk to the planet.

Now NASA records some of the smaller asteroids, those measuring 140 metres wide or more. Of about 25,000 asteroids of this size, so far NASA have recorded the location of about 8,000. Whether NASA can find the rest of the middle-sized NEOs depends on the government giving the money to build NEOCam, a space telescope which would use infrared light to find asteroids.
The movement of asteroids within 7,500,000 kilometres of Earth is dangerous. NASA has created a map of these asteroids, none of which will be a risk in the next 100 years. With technology already available, NASA can track these objects. If the asteroid is likely to hit the Earth, there are two possible responses under development:

The first is the Double Asteroid Test. There are plans to test this equipment on the moon using an asteroid called Didymos. 'Didymoon' is 150 metres wide and orbits its 800-metre mother. There is also a discussion about whether to blow up asteroids close to Earth with bombs. It may sound like a story from a film, and it was the subject of the 1998 film *Armageddon*, but it is a real NASA plan. Eight-ton rockets would be fired at an asteroid with the hope of moving it off course. If the asteroid was too close to Earth for this plan to work, NASA would give an instruction to use bombs to blow up the asteroid.

**Text 5**

Is the 2015 film *Star Wars: Episode VII – The Force Awakens* the same as the very first *Star Wars* film in 1977? Both films are full of entertainment and excitement but more importantly, both films have the same structure. In fact, both films follow a much older structure. George Lucas directed the film and based Star Wars on the ideas in Joseph Campbell's 1949 book, *The Hero with a Thousand Faces*. In his book, Campbell describes the 'monomyth' – a connection between stories from every culture. In short, a hero sets off from home on a journey, where he solves difficulties and defeats enemies to return with a prize.

Typically, at the start of the film the hero lives an ordinary life in a place without much attraction, but something happens that changes everything. At the start of *Star Wars*, Luke lives a simple life with his aunt and uncle. He finds employment repairing robots. When he finds Princess Leia's message to Obi-Wan Kenobi inside the robot R2D2, it is this development that starts the hero on his journey.

According to Campbell, the hero at first refuses the call to adventure, but then a new person appears to show them the direction and travel into the 'special world' where the adventure happens. The next stage includes the hero's education, fighting enemies and meeting friends as the hero prepares to face their biggest test. For Luke the new person is, of course, Obi-Wan. The friends are Han Solo and the robots R2D2 and C3PO, and the enemy is Darth Vader inside the special world of the Death Star.
There often comes a point when they face death or loss. Luke sees Darth Vader kill Obi-Wan, which helps him find the strength he needs later on. When heroes succeed, they return from the special world, changed by their experiences forever. Luke's change comes when he remembers Obi-Wan say, 'Use the force', and he uses it to help him destroy the Death Star.

**Text 6**

Some of the biggest and most expensive communication projects in the world are bridges. Bridges carry cars, trucks and trains across water, mountains or other roads.
If a bridge fails, there can be serious loss of life. That is why bridge engineers, designers and builders must always take their jobs very seriously. The best way for them to prevent these accidents is to understand why bridges fail in the first place. If we can understand bridge failure, this can lead to major improvement in the design, and safety of future projects. There is a lot of discussion about why bridges fail. Here is a list of some main reasons:

**Fire**
In the past, more bridges were made of wood. Sometimes a bridge would catch fire and burn to the ground. With the development of steel, fire destroyed fewer bridges.

**Design**
A large number of bridge accidents happen while bridges are built. There is a connection between these accidents and mistakes in the design by the engineers. The bridge falls down under its own weight, and this can be deadly for the workers on it at the time.

**Earthquakes**
Earthquakes damage all structures, including bridges. Luckily, earthquakes do not happen in every location. Engineers have learned to design bridges that resist movement.

**Poor materials**
The employment of poor quality materials that can only support a certain amount of weight will cause a bridge to fall down.

**Boat or train crash**
Both of these kinds of accidents are very rare, but boats and trains can cause a bridge to collapse for different reasons. With trains, it is the speed of the crash that can bring a bridge down. With boats, it is the very large mass they have that can bring about the collapse, even if they are moving very slowly when it occurs.

Appendix B

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# TEST A

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**Name: _____**

**Class: _____**

**School: _____**

**Task 1. Select the correct response to complete the gap.**
**EXAMPLE:**

I _____ happy.

a. are b. am c. is d. were

1. We can learn from the older _____.

a. generation b. generational c. generative d. generate

2. Did you hear the _____?

a. announce b. announcing c. announced d. announcement

3. The school trip was an _____ success.

a. amazing b. amazement c. amazed d. amaze

4. He received a strong _____.

a. punished b. punish c. punishment d. punishing

5. She always tells very _____ stories.

a. amusement b. amusing c. amuse d. amused

6. She couldn't hide her _____.

a. disappoint b. disappointing c. disappointed d. disappointment

7. The teacher made a _____ to his homework.

a. corrective b. correction c. correct d. correctional

8. He is not very _____.

a. activation b. activity c. active d. activate

9. She is a very _____ artist.

a. creative b. creation c. creatively d. creator

10. The doctor performed the _____.

a. operation b. operationalize c. operational d. operative

11. I felt so _____ to tell her this.

a. embarrassing b. embarrassed c. embarrassment d. embarrass

12. The weather is not very _____ in April.

a. predictable b. prediction c. predict d. predictor

**Task 2. Select the best made-up word to complete the gap.**
**EXAMPLE:**

_____ makes me happy.

a. wugable b. wugly c. wugness d. wugish

1. They had a good _____.

a. romative b. romational c. romation d. romatible

2. The meeting was very _____.

a. lorilize b. lorial c. lorilization d. lorify

3. She made an interesting _____.

a. curfamic b. curfamable c. curfamible d. curfamation

4. I heard a _____ story.

a. jittlish b. jittlement c. jittlify d. jittleness

5. I admire her _____.

a. sufilible b. sufilational c. sufilation d. sufilize

6. She wanted to _____.

a. dantment b. dant c. danting d. danted

7. He got a good _____.

a. blopment b. bloply c. blopish d. blopable

8. The party was very _____.

a. brinable b. brinment c. brinify d. brinize

9. They had a nice _____.

a. tweaged b. tweagish c. tweagable d. tweagment

10. He wanted to _____.

a. scription b. scriptize c. scriptist d. scriptive

11. I could feel the _____.

a. froodly b. froodful c. froodment d. frooden

12. I heard a _____ story.

a. tribative b. tribacism c. tribation d. tribate

**Task 3. You are going to read a made-up word. Complete the gap with part of this word.**

**EXAMPLE**:

| | | |
|---|---|---|
| **Nickler** | Children are too young to | **nickle** . |
| **Snellness** | She is a very | **snell** person. |

1. balfourous — He learnt about _____.
2. brienable — People _____ her.
3. luderous — They showed much _____.
4. bancement — She is teaching them to _____.
5. induption — He would love to _____.
6. duffinity — They were very _____.
7. berrowment — She would like to _____.
8. imigation — They wanted to _____.
9. pringable — He can _____.
10. oligastion — They asked him to _____.
11. regrainment — They told him to _____.
12. sinterity — The boy was very _____.

THANK Y☺U!

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# TEST B

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**Name:** _____

**Class:** _____

**School:** _____

**Task 1. Select the correct response to complete the gap.**
**EXAMPLE:**

I _____ happy.

a. are b. am c. is d. were

1. I'm really sorry to _____ you.

a. interruptio n b. interrupt c. interruptin g d. interrupted

2. Can I make a _____?

a. suggestible b. suggestion c. suggestive d. suggest

3. Computers will never _____ teachers.

a. replace b. replacement c. replaceabl e d. replacing

4. There was a large _____ of books in the library.

a. collection b. collectively c. collect d. collectivize

5. They ruined my _____ of the game.

a. enjoy b. enjoying c. enjoyed d. enjoyment

6. I couldn't find the _____ of the word in the dictionary.

a. translation al b. translation c. translate d. translator

7. They had a good _____.

a. arrange b. arranging c. arranged d. arrangemen t

8. My parents always _____ me to do my best.

a. encourage b. encouragement c. encouragin g d. encouragingly

9. She did everything to _____ her dream.

a. achievemen t b. achieve c. achievable d. achieving

10. They _____ two tickets to the show.

a. reserving b. reservist c. reservation d. reserved

11. They quickly reached an _____.

a. agree b. agreeing c. agreement d. agreed

12. She wanted to _____ all her friends to the party.

a. invitation b. invite c. inviting d. invitational

**Task 2. Select the best made-up word to complete the gap.**
**EXAMPLE:**

_____ makes me happy.

a. wugable b. wugly c. wugness d. wugish

1. They had to _____.

a. tweag b. tweagist c. tweagment d. tweagable

2. She felt so _____.

a. froodity b. froodful c. froodism d. froodment

3. They told him to _____.

a. curfamic b. curfamate c. curfamative d. curfamation

4. She heard a _____.

a. scription b. scriptize c. scriptible d. scriptive

5. He is not very _____.

a. sufilify b. sufilational c. sufilation d. sufilize

6. He received the _____.

a. lorilize b. lorial c. lorilization d. lorify

7. He was a _____ boy.

a. blopment b. bloply c. blopish d. blopity

8. I made a _____ .

a. jittlible b. jittlement c. jittlify d. jittlivize

9. There was much _____ .

a. tribative b. Tribacist c. tribation d. tribatable

10. He prepared a _____.

a. dantibly b. dantize c. dantible d. dantment

11. She is very _____.

a. romative b. romativity c. romation d. romate

12. The party was a _____.

a. brinment b. brinify c. brinable d. brinize

**Task 3. You are going to read a made-up word. Complete the gap with part of this word.**

**EXAMPLE**:

| | | | |
|---|---|---|---|
| **Nickler** | Children are too young to | **nickle** | . |
| **snellness** | She is a very | **snell** | person. |

1. rietable — People _____ him.
2. entravement — She told him to _____.
3. ofliction — She would love to _____.
4. limidation — She wanted to _____.
5. gummable — She can _____.
6. stacement — He is teaching them to _____.
7. adarous — They showed much _____.
8. acklonity — They were very _____.
9. lauderous — He is studying about _____.
10. prosterity — The girl was really _____.
11. buttlement — He would like to _____.
12. desiglation — He asked them to _____.

THANK Y☺U

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