

Reading and Vocabulary

Exploring how Skilled Independent Reading Supports Vocabulary Learning in Primary and Secondary School



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Executive Summary

The Reading and Vocabulary (RAV) project was designed to tackle two widely held concerns. First, teachers are concerned that limited vocabulary knowledge is a barrier to learning for many students (Oxford Language Report, 2018, 2020). Given that reading provides important opportunities for vocabulary learning (Nation et al., 2022), we sought to investigate whether reading can be harnessed to promote vocabulary knowledge. Second, there is a widely held perception that academic attainments decline as students move from primary to secondary school (Deignan et al., 2022), with preliminary evidence indicating that attainments in reading might slow or decline across school transition (Hopwood et al., 2017; West & Schwerdt, 2012). We examine progress in reading and vocabulary knowledge, comparing the summer holiday where students move from primary to secondary school with a non-transition summer holiday to establish whether progress in these attainments slows or declines. Box 1 summarises the objectives of the RAV project.

Box 1. Objectives of the Reading and Vocabulary Project

Objective 1. The triad: Reading proficiency, leisure reading, and vocabulary. To use longitudinal data to characterise the relationship between word reading proficiency, reading comprehension, leisure reading, and vocabulary knowledge (der Kleij et al., 2022).

Objective 2. Harnessing leisure reading. To use a novel experimental approach to explore whether we can increase leisure reading and whether doing so fosters vocabulary knowledge (van der Kleij et al., 2023b).

Objective 3. Transition and socioeconomic status (SES). To use longitudinal data to examine the relation between SES, vocabulary, and reading in middle childhood, during the transition from primary to secondary school (van der Kleij et al., 2023a).

Key findings

Objective 1. The triad: Reading proficiency, leisure reading, and vocabulary

We found that reading is crucial for vocabulary knowledge in two ways:

1. **Word reading proficiency directly boosts vocabulary knowledge.** We found that more proficient readers developed larger vocabularies. This is likely to be due to word reading proficiency freeing up resources for a reader to attend to *meaning* and providing a greater chance of learning new vocabulary.
2. **Word reading proficiency boosts leisure reading which, in turn, drives vocabulary knowledge.** The RAV project highlights the crucial role of both reading proficiency and leisure reading in driving students' vocabulary knowledge. Specifically, we found that more proficient readers spend more time engaging in leisure reading. Indeed, being a more proficient reader will make

reading less effortful and therefore more attractive (van Bergen et al., 2022). In turn, the amount of leisure reading a child engages in predicted their vocabulary knowledge, likely because written language provides a source of diverse vocabulary that readers can learn from (Nation et al., 2022).

Together, word reading proficiency and leisure reading explain 45% of the variance in vocabulary (a large effect size). These findings are published in [van der Kleij et al. \(2022\)](#).

Objective 2. Harnessing leisure reading

In Objective 2, we tracked students' reading of specific books containing target words and randomly assigned half of our participants to a short messaging service (SMS) reading diary that encouraged reading activity through goal setting and individualised feedback. There were two important findings:

1. **The number of exposures to each word directly predicted the amount of knowledge gained.** By tracking students' reading of specific target words, we were able to demonstrate that the more times each word was read, the more knowledge was acquired of that specific word's meaning. This provides robust evidence that leisure reading drives vocabulary growth, such that more reading and exposure to words leads to more word knowledge.
2. **Increasing leisure reading is challenging.** A second goal was to examine whether our reading diary increased the amount of leisure reading. In this respect, our approach was not effective. Our reading-diary intervention group did not differ from the control group in the amount of leisure reading. Our reading-diary intervention was based on an effective approach used with the same age group to promote healthy eating behaviours (Pederson et al., 2016). It was welcomed by teachers who found it feasible to implement with whole year groups of students. However, a relatively small subsample of our participants completed the diary consistently, suggesting that this was not an acceptable approach for students. Although there are indications of a positive effect for this subsample, the low uptake of the diary precludes any clear conclusions about its effects (van der Kleij et al., 2023b, forthcoming).

Objective 3. Transition and socioeconomic status (SES)

These findings are published in [van der Kleij et al. \(2023a\)](#), revealing the following:

1. **There are high levels of reading and vocabulary need in secondary school.** There was considerable variability in reading and vocabulary attainments and there was a persistent group difference between students from lower and higher SES backgrounds, with students from lower SES backgrounds showing lower attainments. In terms of the level of support required, 10–20% of students entering secondary school have reading or vocabulary attainments that are two years or more below what would be expected, on average, for their age. This level of reading will form a barrier to accessing much of the secondary curriculum.
2. **No transition slump in reading and vocabulary.** We measured skills and knowledge using standardised assessments and found no decline in any of our measures, although some

measures showed slower growth during summer holiday periods, when compared with periods during the school year. Importantly, the pace of growth during the school transition period was the same as for any summer holiday period. The pattern of growth depended on the type of attainment being measured: attainments that are most closely related to the school curriculum (e.g., science vocabulary and reading comprehension) showed slower growth over each summer holiday compared to faster growth during the school year.

- 3. There are SES differences for some but not all reading and vocabulary measures.** Students from lower SES backgrounds showed lower attainments at a group level on vocabulary and reading comprehension. This SES difference was persistent over time. The largest disadvantages were shown for attainments that are hardest to teach and are linked most clearly to a child's language exposure (e.g., medium-large effect sizes for everyday vocabulary and small-medium effect sizes for reading comprehension). By contrast, there were no effects of SES on students' word reading proficiency.

Implications for Education

The key implications from our project are:

Word reading proficiency is a key driver of vocabulary knowledge, and therefore all subsequent learning. Children who read below expected levels in secondary school (e.g., reading below the expected level for an 11-year-old) will struggle to learn vocabulary and other curriculum content through independent reading. **Recommended actions:** Use a two-step process of screening followed by diagnostic assessments to identify reading needs in secondary school students. Students may need support with word reading proficiency, reading comprehension, vocabulary, or all three. It is important that secondary schools assess all three, so that targeted support and interventions can be carefully aligned with reading needs.

Leisure reading promotes vocabulary knowledge. Reading proficiency predicts the amount that students read. However, most upper primary and secondary students spend little of their leisure time reading, even if they are proficient readers. We present longitudinal and experimental evidence indicating that the amount of reading students do in their leisure time promotes vocabulary knowledge. **Recommended actions:** Our findings highlight the importance of evidence-based educational approaches that focus on increasing reading motivation and activity, as well as improving reading skills. Objective 2 (harnessing leisure reading) highlights the challenges in developing accessible ways to increase teenage reading and motivates the need for co-designed programmes that are developed with teenagers and teachers from the outset.

Reading and vocabulary are extremely variable and show high levels of need, especially for students from low SES backgrounds. Wide variability in reading and vocabulary in secondary classrooms presents a challenge for teachers in ensuring that all students are able to engage with the curriculum at a level that aligns with their knowledge and skills. Further, we can't assume that all students can follow classroom input and discussions, and access written materials. **Recommended actions:** We recommend continuing professional development and capacity building in reading and language to ensure that all

secondary teachers understand the range of knowledge and skills that they will encounter and feel equipped to tailor classroom practice accordingly. We also recommend a two-step process of screening and diagnostic assessment to identify reading needs and match them to targeted intervention approaches, as well as meeting their needs through the universal offer. Children from lower SES backgrounds are more likely to have reading and vocabulary needs that require support.

Transition to secondary school brings new challenges. As students enter secondary school, it is important to recognise that the environment itself is radically different, and students are having to adapt their existing knowledge and skills to new challenges. **Recommended actions:** Monitoring and targeted support are key to creating a smooth transition and ensuring that all young people have the vocabulary knowledge and reading skills they need to access curriculum materials. Overall, our key findings are reassuring and suggest that the challenge of transition to secondary school may be more about adapting to a new environment with new demands on reading and vocabulary, and not an indication of any decline in students' knowledge and skills.

Future priorities for research, practice, and policy

Research

More work is needed to characterise the drivers of reading success and leisure reading in secondary students. In addition, we need research that considers reading proficiency and reading behaviour together so that we can understand how to promote both. We cannot assume that approaches that are effective in primary school will be effective in secondary school, and we must include teachers and students in this research to ensure that approaches are feasible and acceptable in secondary school, as well as effective (cf. McGeown et al., 2023). Finally, more work is needed to understand the changing demands on reading as students move from primary to secondary school, and beyond (cf. Deignan et al., 2022).

Practice

Our findings indicate that both reading proficiency and leisure reading support progress in vocabulary knowledge. This motivates school literacy strategies in primary and secondary schools that integrate approaches to support reading proficiency and vocabulary knowledge with a rich reading culture that enables reading for pleasure (McGeown et al., 2023). Our research also highlights the need for careful monitoring of reading skills in late primary and secondary school, especially for students from lower SES backgrounds. This will ensure that needs can be identified with precision and aligned with targeted support and interventions. Specifically, a combination of screening and diagnostic assessments should be used to identify reading needs confidently and with precision, so that they can be aligned carefully with the type of support and intervention that is required (for more discussion of this, see Ricketts et al., 2022). Increased engagement in research from schools and students is needed to ensure that research generates the evidence that is most needed by schools, and that schools have access to evidence-based approaches that are effective, feasible, and acceptable in context.

Policy

For policy, our research indicates key priorities for curriculum change and funding for schools. The primary English curriculum focuses on literacy knowledge and skills, whereas the emphasis shifts to English as a discipline in secondary. Policy-level change is needed to promote more continuity in curricula and expectations across primary and secondary settings. For example, knowledge and skills need continued support throughout secondary alongside the English and broader curriculum. In addition, funding is needed to ensure that the secondary curriculum is complemented by robust approaches to identifying and supporting reading and language needs in secondary school.

1. Context

The Reading and Vocabulary (RAV) project was motivated by two concerns about reading and vocabulary held by teachers. First, for many children, limited vocabulary knowledge is a barrier to learning (Oxford Language Report, 2018, 2020). This concern was particularly acute at secondary school, where lessons are taught by specialist teachers who use subject-specific vocabulary, and children are expected to learn from their own reading as well as from lessons. The second concern relates to a slump or reduction in progress as students move from primary to secondary school (Deignan et al., 2022; Hopwood et al., 2017; West & Schwerdt, 2012). In the RAV project, we explored word reading proficiency, reading comprehension, leisure reading, and vocabulary knowledge during the transition from primary to secondary school. We also examined the potential of leisure reading to expand vocabulary knowledge. Word reading proficiency, reading comprehension, vocabulary knowledge, and leisure reading are defined in Box 2.

Box 2. Definition of key terms

In the RAV project, we investigated links between word reading proficiency, reading comprehension, vocabulary knowledge, and leisure reading. These terms encompass knowledge and skills that are complex and multifaceted. Consequently, they are used in different ways by different people and measured differently across research and educational contexts. In this box, we specify how these terms were defined and operationalised for the RAV project, with more details about measurement included in the Methodology section below.

Word Reading Proficiency: This is the accuracy and speed with which someone can read words. In the RAV project, we measured the reading of lists of unconnected real words (e.g., information, garment) and nonwords. (e.g., blurred, hension). Nonwords were included to capture reading of unknown words, where letter by letter decoding is necessary as they can't be recognised from memory. Importantly, word reading proficiency captures more than word reading accuracy and is not the same as the fluency with which someone can read a passage of interconnected text. Instead, our measure of word reading proficiency gives an indication of how effortful it is for a child to read each single word they encounter.

Reading Comprehension: This is the extent to which someone can build a mental model of a text to understand it. The extent to which they can do this will depend on a myriad of factors including, but not limited to, language comprehension, background knowledge, attention, and motivation. In the RAV project, students read extended passages of connected text and were asked questions to capture their literal understanding of the text and whether they had made certain inferences.

Vocabulary Knowledge: This relates to what someone knows about the meaning of individual words. Broadly, vocabulary knowledge encompasses comprehension (listening, reading), production (speaking, writing), breadth (how many words someone knows), and depth (how much an individual knows about a word). A distinction is often made between Tier 1, 2, and 3 words, all of which are

important at school (Beck et al., 2013). Tier 1 words are those that are encountered in everyday conversations. Tier 2 words occur frequently across multiple contexts and are known by most adults (e.g., analyse). Tier 3 words are limited to specific topics and domains (e.g., photosynthesis). In the RAV project, we measured comprehension and breadth by asking whether students could match a spoken word to a picture of its meaning. We also focused on Tier 1 and Tier 3 words.

Leisure reading: This term refers to self-directed reading or volitional reading during leisure time, and can refer to the reading of any content (e.g., comics and online content as well as books). In the RAV project, we asked students about the time they spent reading outside of school.

1.1. Can we harness reading to promote vocabulary knowledge?

We know from previous research that there is enormous variation in what children and adolescents (and indeed adults) know about words. For example, Duff et al. (2015) have shown that this large range is already evident in infancy and predicts progress during primary school. Our previous work highlighted that a substantial number of adolescents in early secondary education have very limited vocabulary knowledge that will limit access to curriculum content (Ricketts et al., 2020). Importantly, although students who perform poorly on language assessments are typically described as having a ‘word gap’ (e.g., Oxford Language Report, 2018), our research has shown that this variation in language attainments is more accurately characterised as a continuous range of knowledge and attainment. In the RAV project, we conceptualise vocabulary outcomes as continuous, and also recognise that any particular measure of vocabulary is imperfect and unlikely to be reflective of all cultures and communities across the UK. Nonetheless, the measures we used indicate the level of “school-relevant” vocabulary that a child has access to when they encounter words in curriculum materials, classroom discussions, and so on.

Vocabulary knowledge is closely linked to reading proficiency (e.g., Cunningham et al., 2021; Ricketts et al., 2020). Indeed, our previous work showed that being a better reader confers advantage for encoding and remembering new words, even when the words are spoken rather than written (Cunningham et al., 2021). This provides a huge educational advantage. For example, imagine a science teacher talking about the difference between refraction and reflection. A child who can learn and recall these new words accurately and precisely will find it much easier to learn the meanings of these words.

The RAV project was developed to explore the role of reading in fostering vocabulary knowledge. Teachers already know that reading is important for raising language attainments, and strong evidence supports a link between reading and vocabulary knowledge (e.g., Ricketts et al., 2020). Indeed, reading is likely to be particularly important for learning new words that are not encountered in everyday language, so called ‘book language’ (Nation et al., 2022). Reading also enables students to experience known words in new contexts so that they can deepen their knowledge of words, learn new senses for words, and so on. What we sought to do was investigate how precisely this might work. Specifically, we investigated how reading (word reading proficiency and reading comprehension) can be harnessed as a route to growing vocabulary knowledge: should we focus on supporting reading skill

during the transition to secondary school? Or should we be increasing the *amount* of reading students engage in, or indeed both? Schools are working hard on both of these things, and we hope that our findings will help them to make decisions about how to target precious resources.

1.2. Is there a primary-secondary transition slump in language and literacy attainments?

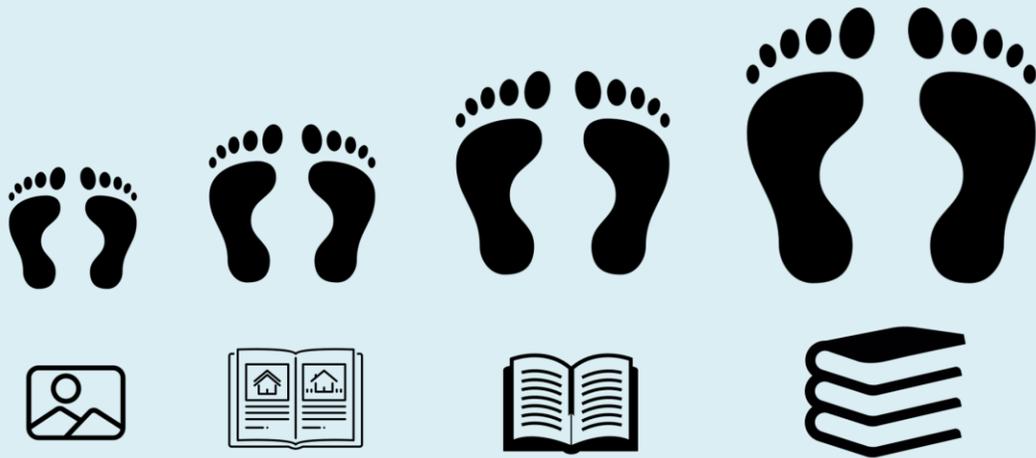
Our second aim was to explore teachers' concerns about a slump in language and literacy attainments as adolescents move from primary to secondary school. The Oxford University Press report explains why teachers are concerned (Oxford Language Report, 2020). Teachers recognise changes in the vocabulary knowledge and literacy skills needed as students move through primary and secondary school. Indeed, new evidence reveals increased language demands at secondary school, compared to primary school (Deignan et al., 2022). Teaching and learning rely on speaking, listening, reading, and writing, and the contents of the curriculum present new and different challenges as students progress. Here, vocabulary provides a clear example as new curriculum topics require knowledge of Tier 3 words (i.e., subject-specific words; Beck et al., 2013) like *photosynthesis*. Learning more about Tier 2 words (Beck et al., 2013) that operate across the curriculum is also important. *Battery* provides a clear example of a Tier 2 word, as it might be encountered in science (source of power) or history (gun battery), or in discussions about assault or intensive farming practices. Other examples are words like *compare*, *analysis*, and *conclusion*. Word learning can entail learning new words, but it is also about refining and deepening knowledge of known words to understand them in new subjects and contexts. As children and young people progress through their school career, expectations also change: they are increasingly expected to learn independently and through their reading at school and at home. Do students have what they need to meet these challenges and expectations? Is there a slump in attainments? Here the previous research evidence was very thin but indicated either a slowing or decline in progress for reading attainments (Hopwood et al., 2017; West and Schwerdt, 2012). Longitudinal research was needed to systematically track progress across transition by using objective and consistent language and literacy assessments, and to compare the transition summer holiday to term-time progress and a non-transition summer holiday.

1.3. The Reading and Vocabulary (RAV) project

The RAV project investigated students' reading and vocabulary development as they move from late primary (Year 6) through to early secondary school (Years 7 and 8). We combined longitudinal and experimental research designs as the gold standard for teasing apart causal relationships between reading and vocabulary (see Box 3).

Box 3. How do we distinguish between cause and consequence?

In the RAV project, we were interested in going beyond the well-established association between reading and vocabulary to understand more specifically how vocabulary relates to word reading proficiency, reading comprehension, and leisure reading. For this, we needed to use research methods that are 'causally sensitive', allowing us to distinguish cause from consequence.



Correlation \neq Causation (otherwise we would predict reading based on shoe size!). icons by Flaticon

Longitudinal data: This is when data are collected from the same individuals across multiple occasions, like progress data collected by schools. The value of these data is that they allow us to examine the *sequence* of events, e.g., how does a child's reading proficiency influence their subsequent growth in vocabulary knowledge? This allows us to go beyond correlations and associations to be more certain about what is the cause (e.g., reading proficiency) and what is the consequence (e.g., vocabulary outcomes). Of course, it matters WHEN each measure was collected (as we could also examine these measures the other way round!). We use longitudinal data in Objective 1 (the triad) and Objective 3 (transition and SES).

Causal modelling: This is an analysis approach that allows us to test alternative models of a causal relationship and assess which causal model is the most likely to be correct (i.e., the best fit to the data). Objective 1 (the triad) and Objective 3 (transition and SES) both use causal modelling. For example, in Objective 1 we test which of three possible theoretical models best explains our data. We "build" a model for each theory, and then use statistical analysis to test which of these models is a better fit. Importantly, this method doesn't identify the correct causal relationship. Instead, it tells us which of the plausible options we have compared is most likely to be right for our data. This approach enables us to test existing theories and provide evidence that can be used to refine and develop these theories.

Experiment: An experiment is the neatest way to determine cause and effect. This is because we can administer a change to half of our participants that are selected randomly, and then examine whether this change has a knock-on effect on the outcome *only* for those participants who received the change. While longitudinal studies are useful for homing in on the direction of a relationship, experiments allow us to rule out the possibility that there is another variable involved that we haven't accounted for. For example, we were interested to know whether reading is causally implicated in vocabulary learning. Our longitudinal data supported this, as does other research evidence. However, it is always possible that this relationship reflects another variable. Objective 2 (harnessing leisure reading) uses an experiment to examine whether increased reading of particular words (the change) has subsequent effects on students' knowledge of those words (the outcome).

2. Objectives

Our overarching aim was to examine the potential of reading to promote vocabulary learning, especially during the transition from primary to secondary education. This was addressed via three objectives (see Box 1, and below) that allowed us to test our hypotheses using a combination of longitudinal and experimental designs as the gold standard for addressing causal hypotheses (see Box 3).

Objective 1. The triad: Reading proficiency, leisure reading, and vocabulary. To use longitudinal data to characterise the relationship between word reading proficiency, reading comprehension, leisure reading and vocabulary knowledge. The findings from Objective 1 are published in van der Kleij et al. (2022). This objective tested the following hypothesis:

1. Word reading proficiency would be associated with vocabulary and reading comprehension: a) directly; b) indirectly via leisure reading; or c) both.

Objective 2. Harnessing leisure reading. To use a novel experimental approach to explore whether we can increase leisure reading and whether doing so fosters vocabulary knowledge (van der Kleij et al., 2023b). This objective tested the following hypotheses:

1. Providing access to books and an SMS-based behaviour-change resource would increase leisure reading in adolescents.
2. Increased exposure to target words whilst reading would lead to better learning of word meanings for these words, with improvements predicted by the quantity of exposures.

Objective 3. Transition and socioeconomic status (SES). To use longitudinal data to examine the relation between SES, vocabulary, and reading in middle childhood, during the transition from primary to secondary school. The findings from Objective 3 are published in van der Kleij et al. (2023a). This objective tested the following hypotheses:

1. Growth in vocabulary and reading comprehension would be slower or decline across the transition summer holiday, compared to during the school year and a non-transition summer break.
2. Students from lower SES backgrounds would generally (as a group) show lower vocabulary and reading comprehension scores, but with less of a clear disadvantage on word reading proficiency.
3. The slowing of growth in vocabulary and reading comprehension over the transition period would be most pronounced for students from lower SES backgrounds.

3. Methodology

3.1. Open Science Commitment

Our methods and analysis plan for each objective were pre-registered on the Open Science Framework and the pre-registered documents are cited in the published papers. Links to all pre-registration documents and publications are included in the Reference section. Below, we summarise the core methods for each aspect of the project: the longitudinal study (Objectives 1 and 3); and the experimental study (Objective 2).

3.2. Ethical Statement

The research conforms to the British Psychological Society Code of Ethics and Conduct. Ethical approval for the longitudinal study (Objectives 1 and 3) was received from Aston University, and for the experimental study (Objective 2) from Royal Holloway, University of London.

3.3. The Longitudinal Study: Tracking reading and vocabulary from primary to secondary school.

The Reading and Vocabulary (RAV) project is a longitudinal study tracking reading proficiency, leisure reading, and vocabulary development. The RAV project built on an earlier longitudinal project, the Aston Literacy Project (ALP), which measured children's reading and related skills from school entry to Primary Year 5. The ALP was funded by the ESRC from 2011 to 2016 and by Aston University in 2017. Findings from the ALP are reported in Cunningham et al. (2015) and Cunningham et al. (2019). The Nuffield Foundation funded the continued longitudinal data collection with the ALP sample from Year 6 (June 2018) until Year 8 (October 2019). These new data were combined with earlier ALP data to address Objective 1 (the triad) and Objective 3 (transition and SES). Data collection for the longitudinal study was completed in early 2020, just before the COVID-19 pandemic led to school closures.

3.3.1. Participants for the longitudinal study

All participants from ALP were invited to participate in RAV. Figure 1 below illustrates the sample who were first recruited to participate in ALP at school entry at age 4 ($M = 4.64$ years, $SD = 0.30$ years). At this point there was a total sample of 788 children, 375 of whom were girls (48%). These children were attending 16 different primary schools in suburban areas of Birmingham, UK. School-level data showed a range of SES backgrounds: Index of Multiple Deprivation (IMD) deciles ranged from 1–10 (Noble et al., 2019), eligibility for Free School Meals (FSM) ranged from 1–48% (M 18%). Participants with English as an Additional Language (EAL) made up 10%. After transition from primary to secondary school, participants were attending 53 secondary schools (IMD decile range 1–10; 16% FSM; 9% EAL).

The study was approved by Aston University's Ethics Committee. At each testing point, we worked with all participants from the on-going study for whom we had parental consent and child assent. Due to the introduction of the EU General Data Protection Regulation (GDPR), new written consent from parents was needed at age 11, causing the large attrition between ages 10–11. However,

the sample of children who were retained in the study was comparable to the sample for which we were not able to gain new written consent.

In the RAV project, we capitalised on this longitudinal data to examine the relationship between reading and vocabulary in adolescents, whilst also accounting for differences in their pre-reading skills at school entry. Objective 1 (the triad) was addressed with data from school entry plus Years 5, 6, and 7. Objective 3 (transition and SES) was addressed with data from Year 5 to Year 8. Importantly, Objective 3 captured students' development before and after the summer holiday during transition to secondary school, as well as a normal summer holiday between Year 7 and Year 8.

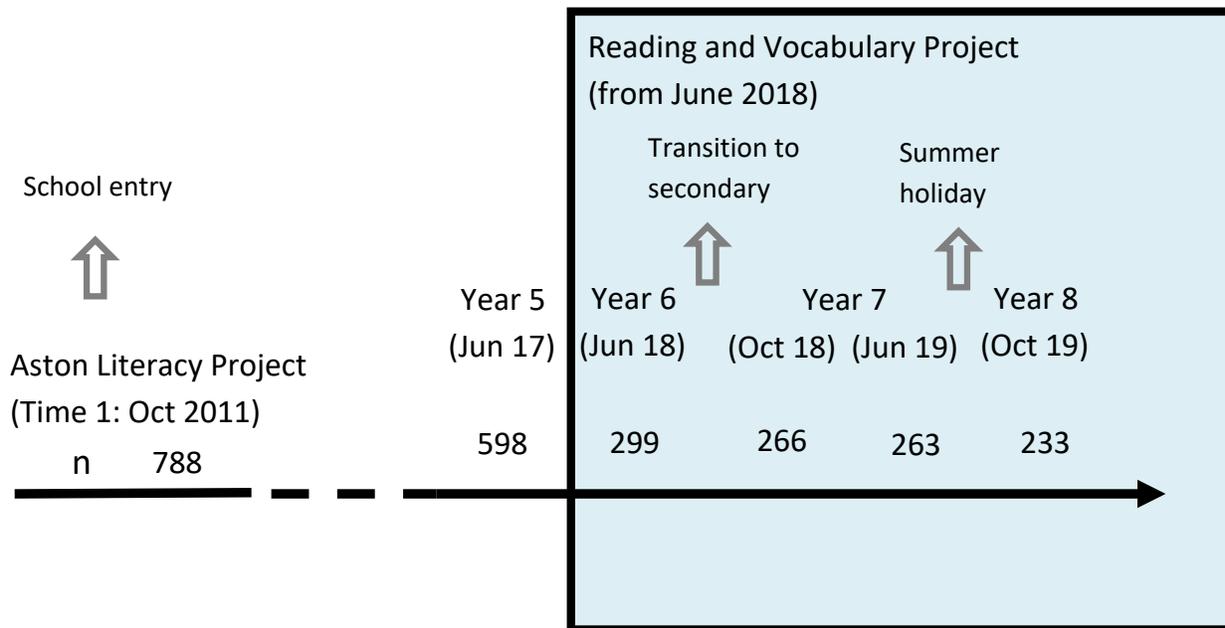


Figure 1. The Aston Literacy Project sample and the timeframe of the Reading and Vocabulary project.

3.3.2. Measures for the longitudinal study

To address Objectives 1 and 3, we assessed word reading proficiency, reading comprehension, leisure reading, and vocabulary (see Box 1). Our measures are summarised below (see van der Kleij, 2022 and 2023a for more detail).

Vocabulary knowledge. We measured both everyday vocabulary knowledge and curriculum vocabulary knowledge. *Everyday vocabulary knowledge* was measured using The British Picture Vocabulary Scale (BPVS-3; Dunn, et al., 2009), for which participants were verbally presented with a word and asked to indicate which of four pictures represented its meaning. *Curriculum vocabulary knowledge* was assessed using a bespoke measure comprising 17 words from the physics curriculum, and 16 from the biology curriculum (see <https://osf.io/c3vmg> for the list of words). We chose these subjects to elicit Tier 3 words (Beck et al., 2013) that relate specifically to a curriculum topic. Participants were asked to indicate which of four pictures corresponded to the target word. A UK platform for

teaching resources (<https://www.stem.org.uk/>) was used to select words from the Key Stage 2 and 3 (ages 9–14) curriculum. These words were then reviewed by several school teachers. For both vocabulary measures, the total number of words correct was used for analysis.

Word reading proficiency. This was assessed with the Test of Word Reading Efficiency (TOWRE-2; Wagner, Torgesen, & Rashotte, 2011), consisting of two subtests (Sight Word Efficiency and Phonemic Decoding Efficiency). In the Sight Word Reading subtest, students correctly read as many words as possible in 45 seconds. In the Phonemic Decoding Efficiency subtest), students correctly read as many nonwords as possible in 45 seconds. This task yields a score that reflects both accuracy and speed.

Reading comprehension. Participants read two age-appropriate passages from the York Assessment of Reading for Comprehension (YARC secondary edition; Stothard et al., 2010), one fiction and one non-fiction. Comprehension was assessed via accuracy in answering 13 open-ended literal and inferential questions about the passage.

Leisure reading. A subset of the Progress in International Reading Literacy Study (PIRLS, 2006) student questionnaire was used to measure the extent to which students engage in leisure reading. PIRLS is a well-established questionnaire that contains questions about reading motivation, the amount of reading, and type of reading materials. Given our focus, we included only questions about the time spent reading (novels or books) outside of school: 1) How much time do you spend reading outside of school? 2) How often do you read for fun? 3) How often do you read stories or novels?

Socioeconomic status. (SES). We collected two measures of SES: Free School Meals (FSM) and parental educational background. Students were classified as lower SES if they had ever been eligible for FSM or their mothers' highest qualification was A-level or lower (equivalent to a high school degree). Our inclusive classification of lower SES is preferable to FSM status alone, which is known to miss many students from low-income families who are at risk of low attainment (Hobbs & Vignoles, 2010).

3.3.3. Approach to analysis for the longitudinal study

Objective 1. The triad: Reading proficiency, leisure reading, and vocabulary. We used a causal modelling analysis technique (see Box 3) to test alternative models of how word reading proficiency is associated with vocabulary and reading comprehension. We used a model comparison approach within Structural Equation Modelling and used goodness-of-fit indices to judge which model should be accepted. The models tested whether word reading proficiency is associated with vocabulary and reading comprehension either: a) directly; b) indirectly via leisure reading; or c) both.

Objective 3. Transition and socioeconomic status (SES). The key focus for this objective was how adolescents' performance on our measures changed over time between Year 5 and Year 8, comparing progress for students from low versus high SES backgrounds. We used causal modelling to examine growth in everyday vocabulary, curriculum vocabulary, word reading, nonword reading, and reading comprehension. As part of our models, we tested the predictive power of SES (lower versus higher). We also included time, comparing four phases: during the school year (primary), the transition

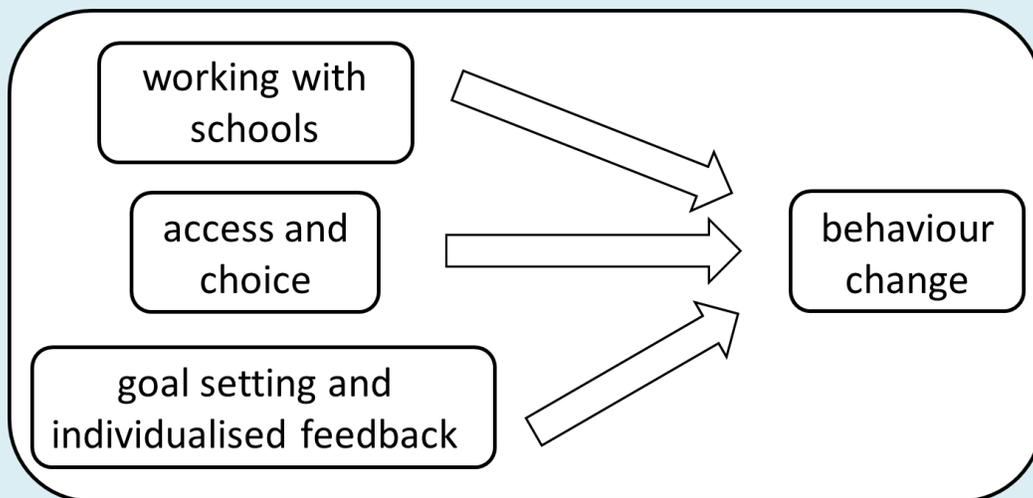
summer holiday, during the school year (secondary), and a non-transition summer holiday. As in Objective 1, we used a model comparison process to assess which models were the best fit to the data.

3. 4. The Experimental Study: Using a reading diary to harness leisure reading for vocabulary

In this experimental study (Objective 2), we adapted a well-established behaviour-change intervention (Pederson et al., 2016) as a novel way to encourage adolescents to read more. The programme involved completing a diary, goal setting, feedback on this goal via text-messages, and rewards. We also provided participants with commercially available fiction books to read in their own time, creating a natural setting for the programme, whilst also tracking the words they encounter and learn. This study also allowed us to investigate whether the amount of print exposure affects vocabulary learning. We hypothesised that: (a) providing books and using an SMS-based reading diary with feedback will increase leisure reading for adolescents who engage with the programme; and (b) reading a word across a larger number of exposures will be associated with greater learning.¹

Box 4. Using behaviour-change interventions with adolescents

Behaviour-change interventions have been used effectively with adolescents to increase healthy eating behaviour. Key elements are: involvement of schools and peers, increased availability of healthy foods, and computer-based individualised feedback with normative information on eating behaviours (Calvert et al., 2019). We based our experimental study (Objective 2: harnessing leisure reading) on Pederson et al.'s (2016) successful intervention to promote healthy eating amongst adolescents. Their intervention group completed daily diaries in which they set goals to eat more fruit and vegetables and received individualised feedback. In the RAV project, we worked closely with schools and ensured access to a choice of books. Adolescents completed diaries in which they set goals and reported their leisure reading. They received individualised feedback based on their goals and leisure reading.



¹Note that this study was initiated in early 2020 but paused shortly after that in response to the COVID-19 pandemic and school closures. The study re-started in 2021 and was completed in 2022.

3.4.1. Participants for the experimental study

Participants comprised 246 students, half of whom were randomly allocated to the experimental group, and the other half to the control group. First, we identified four schools in the South East of England where there was strong motivation from the leadership team to take part in the project. Having a highly motivated leadership team was vital for successful recruitment of students and to support the running of our study with high levels of experimental controls and fidelity. All students in Years 7, 8, and 9 from these schools were invited to take part ($N = 2802$). Participants were randomly selected from those for whom we had parental consent and student assent to take part. Approximately a quarter of the sample were drawn from each of the four schools, and approximately a third from each of the three year groups. Participants ranged in age from 11 to 14 years. Parent education was obtained as measure of socioeconomic status. Of mothers/female guardians, 68% had a university degree or higher, 26% up to a high school degree, 6% unknown. Of fathers/male guardians, 60% had a university degree or higher, 34% up to a high school degree, 6% unknown. The study was approved by Royal Holloway, University of London Ethics Committee.

3.4.2. Procedure and materials for the experimental study

Experimental procedure. The procedure for the experimental study is summarised in Figure 2 below.

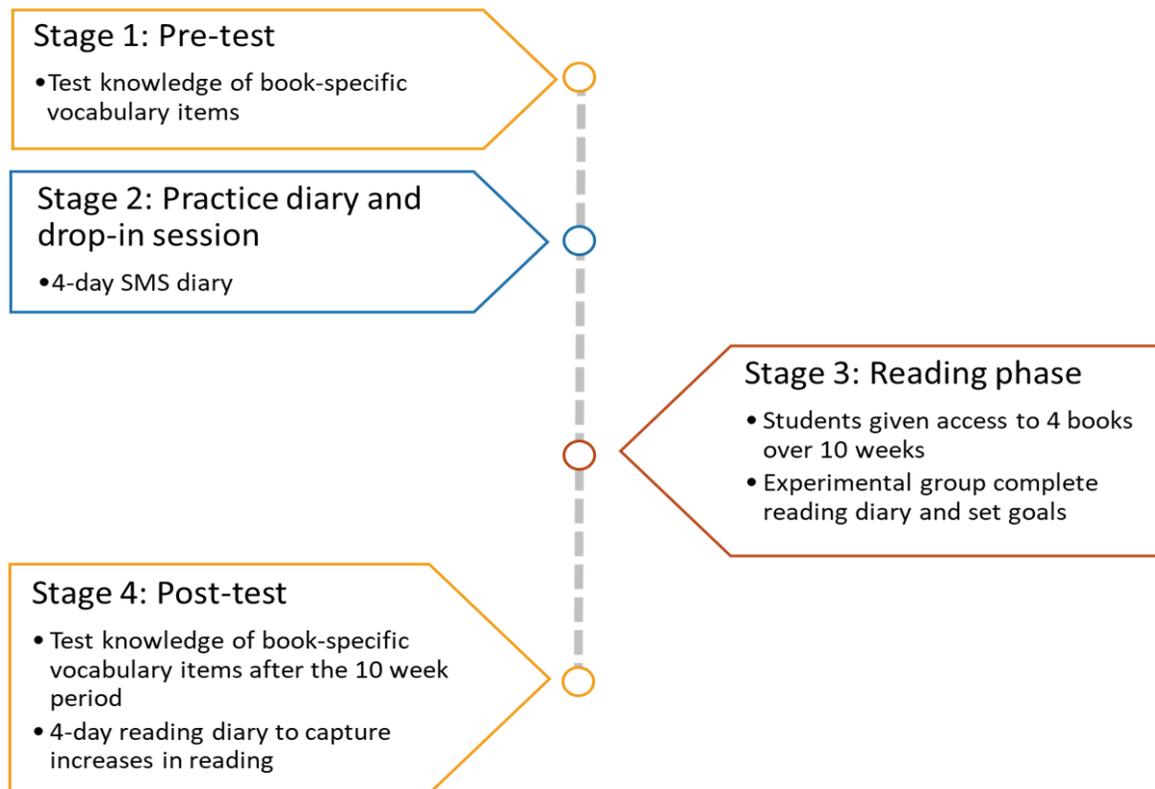


Figure 2. Summary of procedure for Objective 2 (harnessing leisure reading)

Ample copies of four fiction books were given to schools so that they could make these available to participating students (see Figure 3). We identified a list of 40 words that students were unlikely to know and appeared in at least one of the four books. Oxford University Press shared information with us about where the words appeared in the books.



Figure 3. Oxford University Press books used in Objective 2 (harnessing leisure reading)

Before the reading phase (see Figure 2), participants completed a pre-test definitions task in which they were asked to type a definition for each word. Then, participants completed a practice diary and attended a drop-in session about the project. In the reading phase, all participants were able to borrow the books from a school location for a period of 10 weeks. During this time, the experimental group additionally received text messages on each weekday morning asking them to complete the reading diary and set goals online (see Figure 4). For the diary they were asked to report the book that they were reading and the page that they were on. Goal setting involved stating how many pages they wanted to read each day. If goals were reached, they received positive feedback (e.g., 'great, you met your goal!'). If three diaries were completed in a week, this unlocked a clue to help students solve a mystery theft. The control group were able to borrow the books but didn't receive these text messages, complete diaries, or set goals. After the reading phase, participants completed the definitions task a second time so that we could measure changes in vocabulary knowledge after the 10-week reading period. They were also asked to complete a 4-day reading diary.



Figure 4. The reading diary used in Objective 2 (harnessing leisure reading)

Background measures. Alongside the experiment, participants completed background measures to establish reading and spelling proficiency, leisure reading, and vocabulary knowledge. Vocabulary knowledge, reading comprehension, and leisure reading measures are described above (section 3.3.2). We also administered the Woodcock-Johnson sentence reading fluency subtest (Schrank, McGrew, & Mather, 2014) and the British Ability Scales spelling task, where participants are required to spell words to dictation (Elliott & Smith, 2011).

3.4.3 Approach to analysis for the experimental study

Hypothesis 1 was that engagement with the diary and goal-setting approach would increase reading amount. To test this hypothesis, we estimated a linear mixed-effects model with time point (pre-test, post-test) and engagement (number of diaries completed during the reading phase) as fixed effects. Reading amount was the outcome variable. Hypothesis 2 was that students who encountered words more in the books would show greater learning of those words. We combined information about where words occurred in the books with student reports of pages read to calculate how many times they had been exposed to each word during reading. To test Hypothesis 2, we estimated a cumulative link mixed-effects model with time point (pre-test, post-test), exposures, and reading amount as fixed effects, predicting vocabulary knowledge in the definitions task as the outcome variable.

4. Key findings

Objective 1. The triad: Reading proficiency, leisure reading, and vocabulary

We found that reading plays two crucial roles in predicting vocabulary knowledge (see Figure 5). First, word reading proficiency directly predicts vocabulary knowledge. We interpret this to mean that the more efficiently a child can read each word they encounter (i.e., the less effort that goes into reading each word), the more capacity a child has to attend to the meaning of what they are reading and thereby gain vocabulary knowledge. Second, word reading proficiency predicts the amount students read in their leisure time, which in turn predicts their vocabulary knowledge. This finding is in line with the notion that being a more proficient reader will make reading less effortful and therefore more attractive (van Bergen et al., 2022). It also resonates with proposals that time spent reading crucially underpins vocabulary knowledge, because written texts expose individuals to a much greater range of words than spoken language (Nation et al., 2022).

Together, word reading proficiency and leisure reading explain 45% of the variance in vocabulary (a large effect size). Our findings are novel because they bring together two key pieces of evidence in a single model: the link between reading proficiency and leisure reading plus the link between leisure reading and vocabulary. These findings are published in [van der Kleij et al. \(2022\)](#).

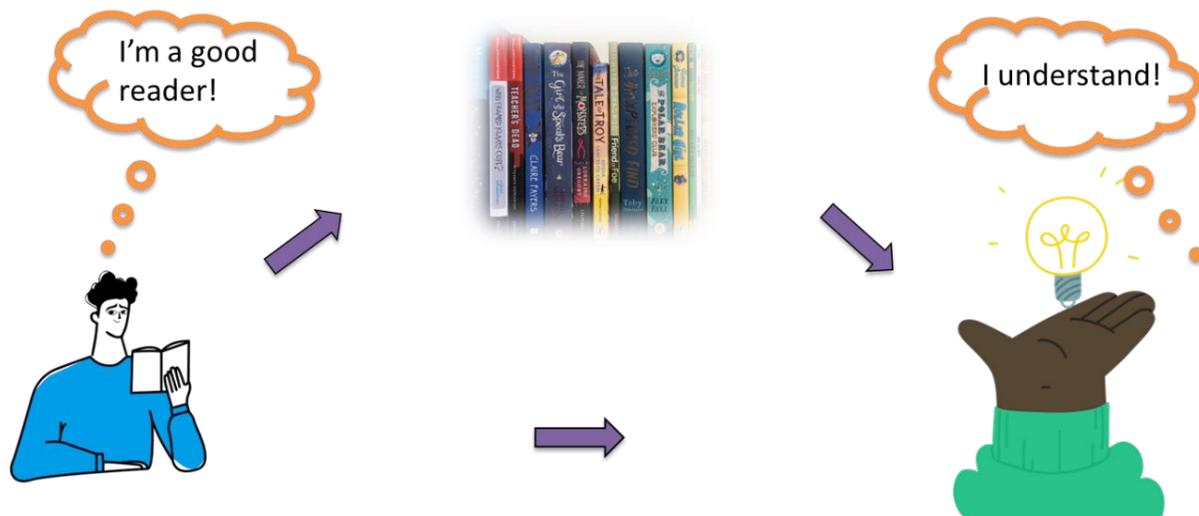


Figure 5. Illustration of Key Findings from Objective 1 (The triad: Reading proficiency, leisure reading, and vocabulary)

Objective 2. Harnessing leisure reading

In Objective 2, we conducted an experiment in which we tracked students' reading of specific books containing target words. All participants had access to the books, but only half of our participants could complete an SMS reading diary. Firstly, we examined whether providing an SMS diary to half of our participants would increase the amount of leisure reading in that group (compared with a comparison group who did not complete the diary). The SMS diary was based on an effective approach used with the same age group to promote healthy eating behaviours (Pederson et al., 2016). It was also developed with input from our advisory group and wider consultation with teachers and teenagers themselves. Despite developing an attractive tool with input from experts as well as our target population, we found that a relatively small subsample of our participants completed the diary consistently. Although there are indications of a positive effect for this subsample, the low uptake of the diary precludes any clear conclusions about its effects (findings will be reported in full in our upcoming paper; van der Kleij et al., 2023b). Nonetheless, the approach was welcomed by teachers who found it feasible to implement with whole year groups of students. A fully co-designed project with input from teenagers and teachers is needed to further investigate acceptable and feasible ways to increase reading activity (cf. the Love to Read project; McGeown et al., 2023).

A second goal was to examine whether the number of exposures to a word during a child's leisure reading predicted their increased vocabulary knowledge for that word. We found that greater exposure to a particular word during reading was predictive of greater knowledge of that word's meaning. While this has been demonstrated in carefully controlled experiments, our study took a novel approach by looking at this naturalistically – when adolescents read real books because they choose to, in their own time. This indicates that the *quantity* of leisure reading is linked to vocabulary growth, adding to growing evidence about how book reading influences language development (Nation et al., 2022).

Objective 3. Transition and socioeconomic status (SES)

Figure 6 shows findings from two of our measures, word reading proficiency (upper panel) and curriculum vocabulary (lower panel), for low and high SES groups from Year 5 to Year 8. In Figure 6, each participating student is represented with a dot at each of our five assessment points. The lines indicate change in average performance over time, with the solid line representing the average for students from lower SES backgrounds and the dashed line the average for students from higher SES backgrounds. These findings are published in [van der Kleij et al. \(2023a\)](#).

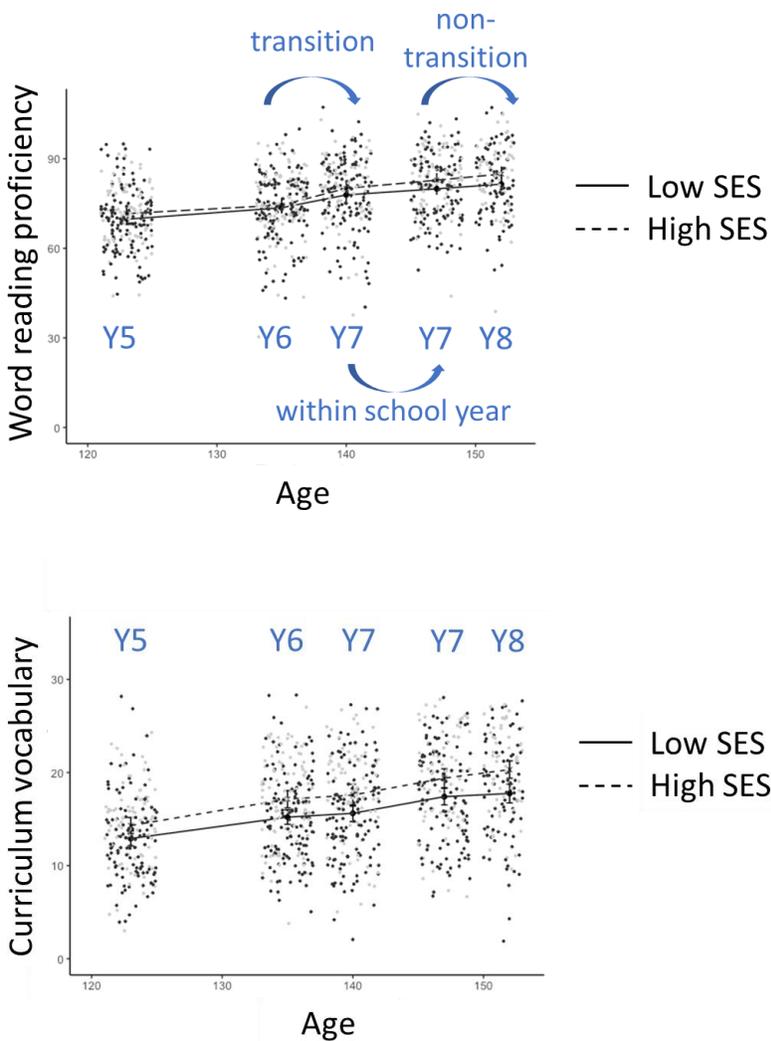


Figure 6. Example results from Objective 3 (transition and SES). Note that data come from van der Kleij et al., 2023a. Dots represent individual students and lines depict average performance for students from lower (solid line) and higher (dashed line) backgrounds. The upper panel summarises data from the word reading proficiency measure, the lower panel summarises data from the curriculum vocabulary measure. Y5, Y6, and so on represent Year 5, Year 6, etc.

The spread of the dots in Figure 6 shows just how variable reading and vocabulary knowledge are in upper primary and lower secondary school. This variation was observed across our measures of word reading proficiency, reading comprehension, everyday vocabulary knowledge, and curriculum vocabulary knowledge, replicating earlier work (Ricketts et al., 2020). Across measures, a substantial minority of students were showing attainments that will limit access to the curriculum. To put this into context, 10–20% of students had reading or vocabulary attainments that were two years or more below what would be expected on average for their age. For example, in Year 7, these children showed reading ages at the level that would be expected for average 6–9 year-old readers. Whilst it feels intuitive to express reading needs with reference to reading ages, we urge extreme caution in doing so for a

number of reasons. Perhaps most importantly, reading ages will vary from test to test, and a discrepancy between age and reading age means something different at different points in reading development. For example, having a reading age two years below age at 14 (i.e., reading age of 12) may not be a cause for concern whereas this would certainly indicate significant need at 6 (i.e., reading age of 4).

Comparing the spread of dots across ages in Figure 6 shows that the range of abilities was largely overlapping as students got older. Nonetheless, there was clear progress as shown by the lines. In relation to transition, we found no evidence of a decline in any skills between primary and secondary school. Indeed, everyday vocabulary knowledge and word reading proficiency continued to grow over each summer holiday and the transition summer holiday was no different from a non-transition summer holiday. Importantly though, progress depended on the skill being measured. For knowledge and skills that are most closely related to the school curriculum (curriculum vocabulary and reading comprehension), progress was more marked during the school year than over each summer holiday (e.g., Figure 6, bottom panel). For word reading proficiency and everyday vocabulary, progress was more consistent between the school year and summer holidays (e.g., Figure 6, top panel). Overall, the key findings are reassuring and suggest that the challenge of transition to secondary school may be more about adapting to a new environment, with new demands on reading and vocabulary, and not an indication of any decline in students' knowledge and skill.

In Figure 6, the average performance of SES groups over time is represented by a solid line (lower SES) and broken line (higher SES). Here, we found sustained differences between groups on reading comprehension and vocabulary knowledge measures (e.g., Figure 6, bottom panel) with students from lower SES backgrounds showing lower attainments. SES differences were not observed for word reading proficiency (Figure 6, top panel). Importantly, SES effects were observed for attainments that are hardest to teach and are linked most clearly to a child's language exposure. The models we report in [van der Kleij et al. \(2023a\)](#) don't produce an easy-to-interpret effect size (since the effects are calculated at both participant and item levels across time). Nevertheless, simple group differences between low and high SES children reveal effect sizes ranging from medium-to-large for vocabulary measures, small-to-medium for reading comprehension measures, and small or less than small for reading proficiency measures. It was reassuring to see that there were no effects of SES on students' word reading proficiency. This is not because all students had achieved maximum scores on our word reading proficiency measure. In fact, we observed significant growth in word reading proficiency throughout our study.

5. Implications for Education

5.1. Can we harness reading to promote vocabulary knowledge?

5.1.1. Longitudinal data reveal that reading supports progress in vocabulary knowledge

Our longitudinal findings suggest that reading drives improvements in vocabulary knowledge. In brief, and as illustrated in Figure 5, we find that the proficiency with which a child can read words predicts the amount of leisure reading a child engages with, which in turn predicts their vocabulary knowledge. Our interpretation is in line with existing research on reading and vocabulary. First, word reading proficiency is a crucial prerequisite for leisure reading (van Bergen et al., 2018). Children and young people can only engage in leisure reading once they have acquired enough word reading proficiency to read independently. Further, those who find reading less effortful are more likely to read in their spare time. This practice can then promote knowledge and skills creating a virtuous circle with reading proficiency promoting leisure reading and so on. Second, written texts provide access to diverse and rich vocabulary, and are therefore a crucial route to vocabulary knowledge (Nation et al., 2022).

An important additional finding is that word reading proficiency also had a direct influence on vocabulary knowledge. This influence has received much less attention in the literature than the indirect route and this is a novel observation from our project. Our interpretation is that adolescents for whom reading is less effortful (i.e., those who read more efficiently) have the capacity to attend to the meaning of a text, and therefore a greater potential to learn new words from what they are reading. In line with this interpretation, we also found that reading proficiency had a direct influence on reading comprehension. In fact, the indirect link via leisure reading was not significant for reading comprehension, suggesting that word reading proficiency played the most crucial role in their ability to interpret the texts we gave them. Of course, with different texts (e.g., including more challenging vocabulary) we may observe a different pattern, including a clearer benefit of leisure reading.

5.1.2. Experimental data provide robust evidence that reading is causally implicated in vocabulary learning

While longitudinal data help us to understand cause and consequence to some extent, stronger evidence comes from experimental designs (see Box 3). In Objective 2 (harnessing leisure reading), we examined whether we could intervene to increase secondary students' leisure reading, in turn, to promote their vocabulary knowledge. The RAV project has shown that a diary-based approach was welcomed by secondary schools and was feasible to implement at scale by schools. This was the case, despite a lingering impact of the COVID-19 pandemic and closures on teacher workload and evolving school policies and priorities.

We uncovered some key challenges in terms of developing a successful programme. Although behaviour change interventions are used widely in health contexts and have shown success with adolescents (see Box 3), they are relatively new in an educational context. In our study, the intervention was not linked to clear increases in leisure reading, and so future work is needed to find effective

approaches for increasing reading amount. Importantly, whilst some students engaged actively with our reading diary, they were in the minority. Therefore, our approach may not have been feasible or acceptable to most students. Any work that aims to motivate leisure reading must also consider adolescent perspectives as efforts are unlikely to be effective if there is low take up.

Nevertheless, our experimental study provided novel evidence about how reading builds vocabulary. Namely, the number of encounters with a word was linked to learning of that word. This is an important finding, as this has not been demonstrated previously in such a naturalistic context. In our study, students read real books published by Oxford University Press. This is encouraging because once we find a way to increase leisure reading in adolescents, we can be confident that this will indeed impact on their vocabulary.

5.2. Is there a primary-secondary transition slump in language attainments?

5.2.1. No transition slump in reading and vocabulary

Our longitudinal findings show no evidence of a slump for any of our reading and vocabulary measures. Word reading proficiency and everyday vocabulary measures showed progress during the school year and during summer holidays. Curriculum vocabulary and reading comprehension did show growth that was slower during the transition summer holiday than during the school year, but crucially this slowing was identical to that observed during a non-transition summer holiday. Our research suggests that the transition period could more accurately be described as an increase in challenge and expectations, rather than a reduction in attainments (see Figure 7).

5.2.2. A changing environment that brings new and different challenges and expectations

As students enter secondary school, it is important to recognise that the environment itself is radically different, and students are having to adapt their existing knowledge and skills to new challenges. Work is emerging that aims to understand changes in language and literacy demands from primary to secondary (e.g., Deignan et al., 2022). We look forward to seeing more research in this vein. For example, the change may be gradual, as depicted in the top panel of Figure 7. Alternatively, it might be more of an abrupt ‘jump’, as shown in the bottom panel of Figure 7. Students may also need to use and show their reading and vocabulary differently in the secondary context – for example, as they experience new kinds of texts, encounter known words in more diverse contexts, and demonstrate their knowledge in new formats. Understanding more about these and other questions will place teachers and parents in a better position to work together to support students as they transition from primary to secondary school. Monitoring and targeted support are key to creating a smooth transition and ensuring that all young people have the vocabulary knowledge and reading skills they need to access curriculum materials.

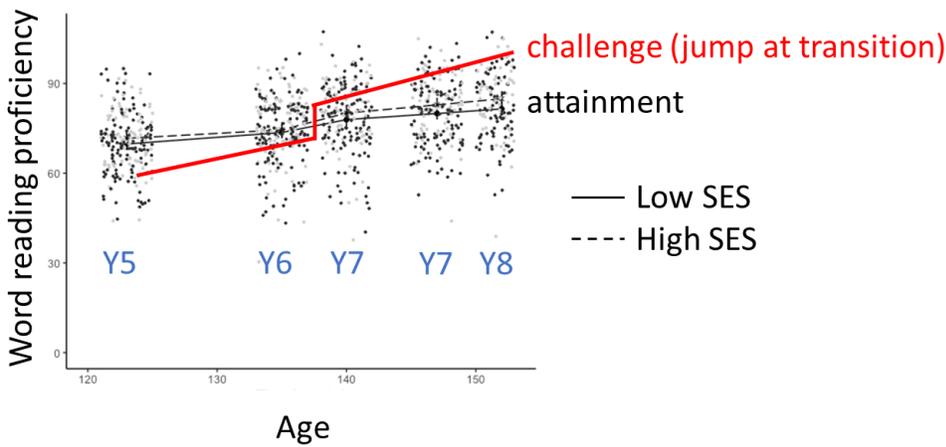
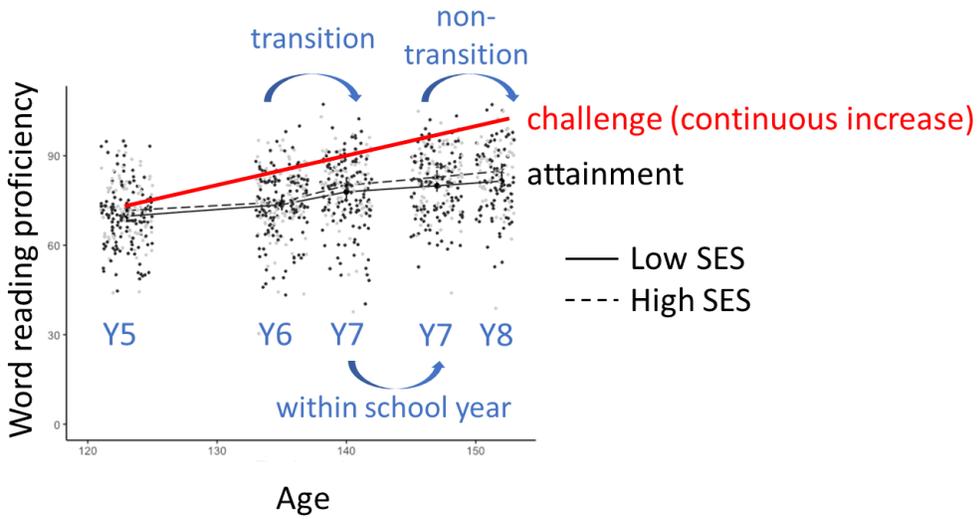


Figure 7. Conceptualising the relationship between changing attainments and challenge at the transition from primary to secondary school. Note that we use data from one of our reading measures, word reading proficiency (van der Kleij et al., 2023a). The red lines represent hypothetical increases in the level of challenge that the curriculum brings, with the top panel showing a gradual increase and the bottom panel showing a more qualitative ‘jump’. Y5, Y6, and so on represent Year 5, Year 6, etc.

5.2.2. High levels of reading and vocabulary need that require support and interventions

Reading and vocabulary were extremely variable in upper primary and secondary school, presenting a challenge for teachers in ensuring that all students are able to engage with the curriculum at a level that aligns with their knowledge and skills. Further, many students showed reading and vocabulary knowledge below expected levels in secondary school. There are different ways of defining expected levels. In schools, attainments tend to be criterion-referenced and focused on whether a student has reached curriculum-linked expectations. In our research, we took a different approach, using norm-referenced assessments that reveal how student attainments compare to age-related expectations. This revealed a substantial minority who read far below the average level for their age, indicating high levels

of reading need that will form a barrier to learning because their reading proficiency will not enable them to read the texts they are expected to learn from. Monitoring reading skills and providing support is essential in secondary school. Some students may need support with word reading proficiency, some with reading comprehension, and some with both. It is important that secondary schools assess both aspects of reading so that targeted support and interventions can be carefully aligned with reading needs (Figure 8).

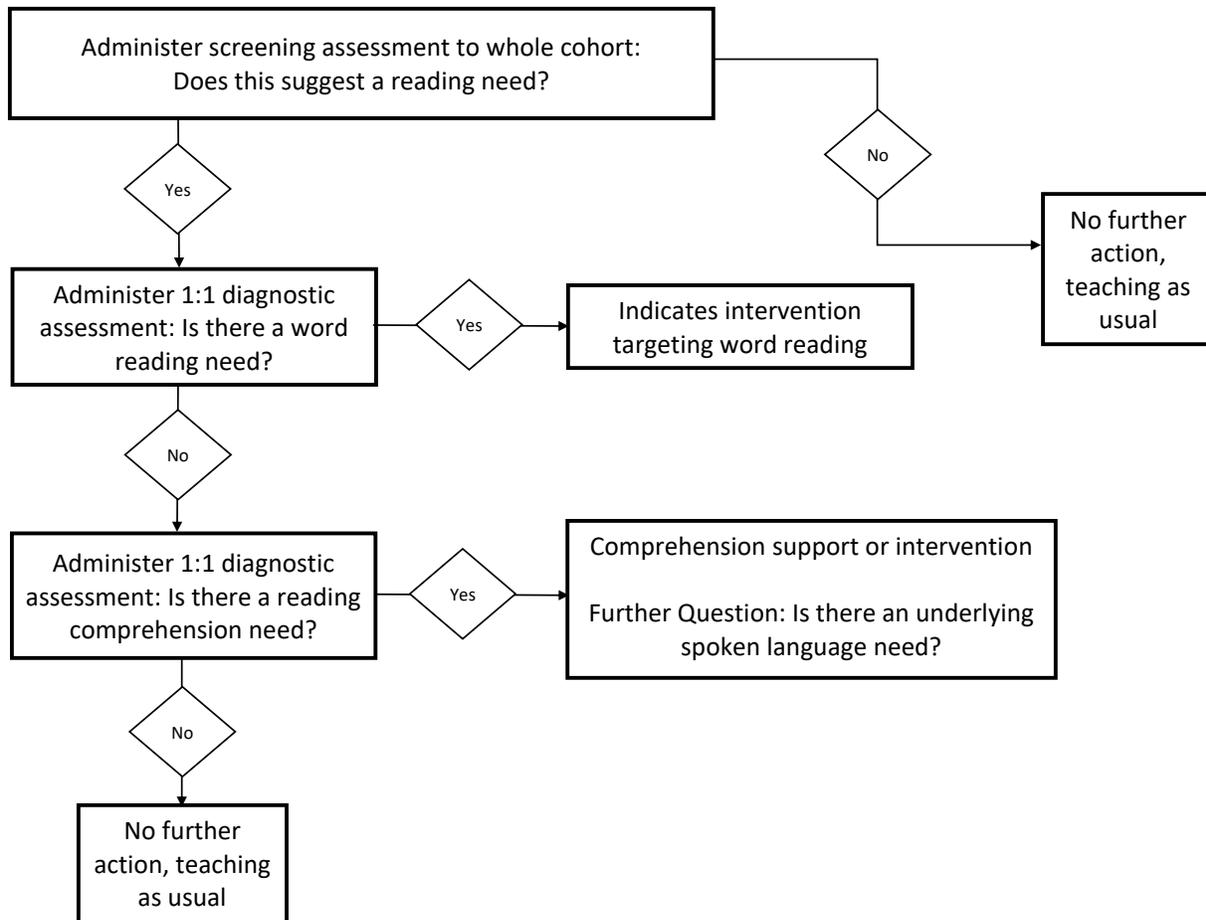


Figure 8. A two-step approach to identifying reading needs (from Ricketts et al., 2022). Step 1 involves screening students in groups to identify likely reading needs. Step 2 uses diagnostic assessments to confirm and specify needs.

As illustrated in Figure 8, we recommend a two-step process to ensure that reading needs can be identified with confidence and in a way that is feasible in the secondary context (for more information, see Ricketts et al., 2022). The first step is to use a screening tool that can be administered to groups of students to identify whether a reading need is likely. Screening tools tend to over-identify reading needs

and lack precision, and so these should be followed up with individualised diagnostic assessments that confirm reading needs and provide additional information about their nature. This second step is crucial to avoid providing resource intensive support and interventions where they aren't needed, either because the child does not have a reading need, or because their need is not well aligned with that kind of support or intervention (e.g., phonics support is not appropriate when the need is reading *comprehension* rather than word reading proficiency).

5.2.3. Socioeconomic (SES) differences for some but not all reading and vocabulary measures

Our longitudinal findings also revealed that the effect of SES on reading and vocabulary persists into secondary school, although there is no evidence of a widening “gap” (e.g., Oxford Language Report, 2018). When addressing SES inequalities, particular attention should be paid to language skills. The disadvantage for lower SES students was greatest for vocabulary and reading comprehension, and both rely heavily on a child's language exposure. In combination with our other findings, this highlights the potential of reading as a powerful tool for boosting language skills (with direct and indirect consequences for vocabulary). Developing practical materials and teaching strategies for harnessing this is therefore the next key priority.

As we discuss above, reading proficiency predicts the amount that adolescents read. However, most upper primary and secondary students spend little of their leisure reading, even if they are proficient readers. We present longitudinal and experimental evidence indicating that reading more promotes vocabulary knowledge. Taken together, our findings emphasise the importance of evidence-based educational approaches that focus on increasing reading motivation and activity, as well as reading skills. Our SMS-diary study highlights the challenges in developing accessible ways to increase teenage reading and motivates the need for co-designed programmes that are developed with teenagers and teachers from the outset.

6. Priorities for future research, practice and policy

Research. More work is needed to characterise the drivers of reading success and leisure reading in secondary students. In addition, we need research that considers reading proficiency and reading behaviour together, so that we can understand how to promote both. We cannot assume that approaches that are effective in primary school will be effective in secondary school. We must include teachers and students in this research to ensure that approaches are feasible and acceptable in secondary school, as well as effective (cf. McGeown et al., 2023). Finally, more work is needed to understand the changing demands on reading as students move from primary to secondary school, and beyond (cf. Deignan et al., 2022).

Practice. Our findings indicate that both reading proficiency and leisure reading support progress in vocabulary knowledge. This motivates school literacy strategies in primary and secondary schools that integrate approaches to support reading proficiency and vocabulary knowledge with a rich reading culture that enables reading for pleasure (McGeown et al., 2023). Our research has also highlighted the need for careful monitoring of reading skills in late primary and secondary school, especially for students from lower SES backgrounds. This will ensure that needs can be identified with precision and aligned with targeted support and interventions. Specifically, a combination of screening and diagnostic assessments should be used to identify reading needs confidently and with precision, so that they can be aligned carefully with the type of support and intervention that is required (for more discussion of this, see Ricketts et al., 2022). Increased engagement in research from schools and students is needed to ensure that research generates the evidence that is most needed by schools, and that schools have access to evidence-based approaches that are effective, feasible, and acceptable in context.

Policy. For policy, our research indicates key priorities for curriculum change and funding for schools. The primary English curriculum focuses on literacy knowledge and skills, whereas the emphasis shifts to English as a discipline in secondary. Policy-level change is needed to promote more continuity in curricula and expectations across primary and secondary settings. In addition, funding is needed to ensure that the secondary English curriculum is complemented by robust approaches to identifying and supporting reading and language needs in secondary school.

7. Outputs

Pre-registration documents and publications for each objective

Objective 1. The triad: Reading proficiency, leisure reading, and vocabulary. van der Kleij, S. W., Burgess, A. P., Ricketts, J., & Shapiro, L. R. (2022). From Bibliophile to Sesquipedalian: Modeling the Role of Reading Experience in Vocabulary and Reading Comprehension. *Scientific Studies of Reading*, 1-13. doi:10.1080/10888438.2022.2068418 Pre-registration documents: <https://osf.io/h8ybz/>

Objective 2. Harnessing leisure reading. van der Kleij, Groenhoej, Vousden, Burgess, Shapiro & Ricketts (2023b). Can reading for pleasure support vocabulary learning? A naturalistic experiment. Stage 1 Registered Report accepted in *Scientific Studies of Reading*. Stage 2 close to submission. Pre-registration: <https://doi.org/10.17605/OSF.IO/HZF4Q>

Objective 3. Transition and SES. van der Kleij, S. W., Burgess, A. P., Ricketts, J., & Shapiro, L. R. (2023a). Tracking vocabulary and reading growth in children from lower and higher socioeconomic backgrounds during the transition from primary to secondary education. *Child Development*, doi: <https://doi.org/10.1111/cdev.13862> Pre-registration documents: <https://osf.io/c3vmg>.

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